

# YEARBOOK *of the* ASSOCIATION *of* PACIFIC COAST GEOGRAPHERS



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## INDUSTRIALIZATION: A PANACEA FOR UNDERDEVELOPED NATIONS?\*

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Probably 1,600,000,000 of the approximately 2,500,000,000 people of the earth are ill-fed, ill-clothed, and ill-housed. This situation, of course, is not new; it has weighed down the masses in Asia, Africa, most of Latin America, and portions of eastern and southern Europe for centuries, many of these people accepting their lot philosophically. What IS new is that perhaps a billion of these people are experiencing "a revolution of expectations," that is, they no longer believe that poverty, illiteracy, disease, and premature death are inevitable. Accordingly, they fervently desire to alter their status. In addition to wanting full bellies, they want to improve their health, reduce their awful infant mortality, and raise their life expectancy, which ranges up to 35 years in contrast to 68 years for the United States. In short, as Western standards are unfolded to them by improved means of communications, they are demanding that these standards be made available to them. There is also the purely psychological factor, the idea that industrial peoples alone are "free" peoples.

Why are these hundreds of millions of human beings at the bottom of the ladder? Are they incompetent, are they lazy, or does their social and economic system doom them? Are politics the reason? Is there overpopulation in all these lands? Are their natural environments so niggardly as to be incapable of sustaining them? Have they ruined their lands through wars, overgrazing, fires, floods, deforestation and erosion? Actually no one of these reasons is the answer, for the overall situation in China differs markedly from that in Egypt, and that in Liberia from that in Ecuador. In the final analysis each nation faces problems created by its own natural environment and history.

The earth's land surface comprises some 55 million square miles of which 10 million square miles are covered with ice and snow, or are too wet, too dry, or too mountainous for human beings to occupy in any considerable numbers. Less than one-half of the remaining 45 million square miles is arable and, therefore, much of it is sparsely settled. Thus there are only some 16.5 million square miles of cultivable land to support the 2,500,000,000 people or about 1 to 2 acres of cultivable land for each inhabitant of the earth. This does not mean of course, that the so-called restrictive environments are human vacuums; what

\*Presidential address of the Association of Pacific Coast Geographers, Pasadena, June, 1955.

it does indicate is that intelligent human beings will not live in the hardest way in the hardest milieus.

Two-thirds of the earth's inhabitants dwell in four regions containing only one tenth of the land surface; these regions are southeastern Asia, southern Asia, Europe, and northeastern United States, all in the Northern Hemisphere. This distribution results from (1) the relatively small portion of the earth capable of sustaining human beings in appreciable numbers and (2) the history of population growth, an important phase of culture history.

We are all aware that population growth during the past three centuries has not been identical on the several continents: whereas the increase was 5-fold for the world as a whole, it was 111-fold for North America, 23 for Latin America, 6½ for Oceania, 6 for Europe (including the Soviet Union), 5 for Asia, and 2 for Africa. (1)

In nonindustrial countries, the population pattern is essentially one of high birthrate, and high deathrate, whereas in industrialized nations the pattern is one of low birthrate, and low deathrate.

With a total population of 2,500,000,000 persons on a cultivable land area of 16.5 million square miles, (2) and with this population increasing at the fantastic and explosive rate of 25 million per year, 70,000 per day and nearly 3,000 per hour, the world faces a major problem. Few would disagree with Henry Pratt Fairchild when he calls these figures "the most important statistics in the world" for all human interests have meaning only as they are projected against the encompassing background of population and its growth. (3) When we note that the 70,000 new mouths added daily go with a loss of 40,000 food-producing acres, we dare not take the situation lightly, for we see that the carrying capacity of the land is failing to keep pace with the increase in population. According to demographers, it is entirely possible that the increase in world population may necessitate doubling the food supply during the next 50 years. The underdeveloped lands can hardly be expected to produce much of this increase. The only countries showing great promise of providing surplus foods and even of meeting their own requirements are the privileged lands, Argentina, Australia, Canada, and the United States. However, even this group is far from possessing inexhaustible agricultural resources, for it faces the prospect of having in the not distant future to curtail exports in order to satisfy the demands of its own rapidly growing population. L. Dudley Stamp challenges us to regard the other nations as "the outstandingly underdeveloped countries of the world" because their output per unit area is so low. (4)

It is the purpose of this paper to point out which countries are underdeveloped, to tell what we mean by "underdeveloped" lands, to provide criteria for their determination and to attempt to answer the question as to whether industrialization is the panacea for the economic ills of underdeveloped nations.

An avalanche of literature is pouring from the presses of the world dealing with the demographic, economic, social, and political aspects of the underdeveloped lands. Little use, however, is being made of geography. And yet there is great need for geographical analysis. I have undertaken this study because of my long-time interest in industrial geography and international relations. There is much truth in the statement made by Julian Huxley in 1950 that the 20th century would in the future be regarded not as the century of wars or even of the discovery of the atom, but as the century in which mankind for the first time recognized the need to take steps to control popula-



Fig. 1. The level of world economic development.



**Fig. 2. The world per capita daily consumption of calories.**

Fig. 2. The world per capita daily consumption of calories.



### What are "Underdeveloped" Lands?

tion growth in order to bring people and resources into some degree of balance. (5)

In order to get the whole picture, we should note that there are three sharply contrasted world economies: the Western, the Communist, and the Underdeveloped. A few high spots regarding each follows:

**Western Industrial Countries.** The countries falling into this group are the United States, Canada, western Europe, and Australia, all settled by peoples from northwestern Europe. The population of these lands numbers somewhat more than 375 million or slightly less than one-sixth of the total for the world. "Industrial" is an appropriate adjective for characterizing this group, because a much larger percentage of the total population is engaged in industry than in agriculture or any other economic enterprise. In the United States in 1950 only 15.6 per cent of the total population consisted of rural farm dwellers. Industrial production is primarily to satisfy the desires and wants of the people.

**The Communist Bloc.** The countries comprising this economic system extend from central Europe to the Pacific Ocean. Except for China, which indisputably falls into the underdeveloped classification, the Communist lands are regarded as intermediate between the advanced and the underdeveloped. There is not a single advanced nation in this group. In number of persons included, this bloc ranks second with about 740 million.

The Communist system is imposing on hundreds of millions of people a pattern of economic development based on a body of dogmas and built from the top down. Everything goes according to plan and though the plans seldom attain their goals, the overall achievements are noteworthy. Results, however, are gained at terrific cost. Compared with the Western system, that of the Communists is cumbersome, slow, and cruel. To date the system has not worked well in developing agriculture, though it has in building up industry if we overlook the cost in suffering and sacrifice, in internal tensions, and in ruthlessness.

**The Underdeveloped Countries** which include non-communist Asia, most of Africa, and nearly all of Latin America, are those that have not reached the level of economic development characterizing Northwestern Europe and the United States, given their own known resources and the present level of technological knowledge; where most of the inhabitants live under conditions approaching misery and where there is chronic mass poverty that is not the result of a temporary calamity; where the people are poor because their lands contain so little capable of being developed; where well over half the gainfully occupied males are engaged in farming, hunting, or forest gathering, where the inhabitants employ backward and obsolete methods of production and utilize little inanimate power; where the lands are overpopulated with respect to the resources available, the amount of arable land and the raw materials for industry; where there is a high ratio of agriculture to other forms of employment, but where the diet on all counts is inadequate; where the social system is static and rigid; where disease is rampant, life expectancy low and illiteracy the rule. This definition is intended to cover both the densely and the sparsely populated lands and those that are with and without natural resources.

### Which Are and Where Are the Underdeveloped Countries?

Figure 1 shows those countries which are commonly regarded as under-



developed. It is to be noted that for the most part they are tropical and sub-tropical. Here nature herself is the worst enemy to progress.

#### **Bases for Categorizing the Underdeveloped Countries**

Three criteria are used here in arriving at the categories—advanced, intermediate, and underdeveloped, into which all countries fall:

- 1) Annual income per capita
- 2) Calories consumed daily per capita
- 3) Annual per capita consumption of inanimate energy.

It is significant that maps of all three coincide remarkably well (Fig. 1, 2, and 3).

If these three maps are superimposed one upon another, their boundaries coincide remarkably well. The underdeveloped countries are thus found to suffer on all three counts, low per capita income, low per capita calorie consumption, and low per capita consumption of inanimate energy. Yet it is these very countries that contain most of the world's people. In spite of the growing demand for plant products from cultivated land, only about one tenth of the earth's land surface has the combination of favorable climate, soil, and terrain adapted to food production.

**Income Per Capita** is regarded as the best criterion for classifying the countries of the world. The 69 countries\* categorized as underdeveloped and comprising two-thirds of the population of the earth, have per capita annual incomes averaging less than \$150 (Fig. 1). These incomes compare with more than \$1500 per capita for the United States.

**Daily Per Capita Calorie Consumption.** If a human being is to live, he must eat. And if he is to function at his optimum, he must have a minimum of 2,500 calories of nourishing food daily. This scientific fact is unalterable. In all the countries classed as underdeveloped, the population averages less than 2,500 calories per day per person (Fig. 2). For countries such as China, India, Iran, Liberia, or Bolivia, to average 2,500 calories would call for an "agricultural revolution."

**Inanimate Energy Consumption.** Energy is the substance of a nation's strength. It is the effort behind all productive activity. In the underdeveloped countries energy is more apt to be the effort expended by human muscle or that obtained from draft animals, than that of inanimate energy.

The underdeveloped countries consume only 1/20 as much mechanical energy per capita as the advanced industrial nations. (6) They average only up to 1,000 kilowatt hours per capita, compare with 1,000 to 2,500 for the intermediate countries and 2,500 to 5,000 for the advanced ones. (Fig. 3)

#### **It is the the Agricultural Lands That Are Underdeveloped:**

##### **Must They Be?**

Every one of the underdeveloped countries is overwhelmingly agricultural. Most of the developed countries are industrial. With about 18 per cent of the world's people, the developed countries earn nearly 70 per cent of the world's income. Does this mean that agricultural countries are synonymous with under-

\*As used here the term "country" refers to any nation, dominion, or colony, any area that is statistically distinguishable.

developed countries? Mandelbaum in his **Industrialization of Backward Areas** says:

"It is a firmly established generalization that for every great region of the world living standards tend to be higher the smaller the relative importance of agriculture as a field of employment. There is still a large discrepancy between **per capita** incomes from agriculture and manufacturing if we consider the world as a whole." (7)

The underdeveloped countries show a high ratio of farmers to farm land. Taken as a unit they average 113 male agriculturalists per square mile of agricultural land compared with 32 for the developed countries. (8)

Industrial progress has by-passed the underdeveloped lands which contain more than half of the world's people leaving large numbers to eke out a precarious livelihood from submarginal lands. Even those who work better land get low yields per head, because too many people must share the harvest.

If these underdeveloped agricultural lands are determined to industrialize, a pre-condition to this change should be a transformation of rural life: subsistence farming must be eliminated and replaced by an economy based upon the commercial exchange of goods. Nowhere does subsistence farming provide more than a bare living.

#### **Can World Hunger Be Satiated - - Particularly in Eastern and Southern Asia, the Middle East, Africa, and Latin America?**

Technology has enabled the peoples of the West to overcome great difficulties and to produce far more food than they themselves require. The United States with 30 million more mouths to feed than it had in 1940 and with 2.5 million fewer farm workers has been eating better than at any time in its history. This near-miracle has been achieved by utilizing some 14 million pieces of motorized farm equipment. Can this substitution of machines for men do in the underdeveloped countries what it has done in the United States? Unfortunately, the answer is no. Whereas it is true that world food output is at least running slightly ahead of world population growth, it is also true that it is the advanced countries, not the underdeveloped ones, that are benefiting from modern production techniques. The underdeveloped lands, except in years when natural conditions are unusually favorable, are actually falling behind. This results in large part from the fact that their agricultural methods and systems of land tenure are shamefully outmoded. Contrast harvesting in the United States, for example, where the new combines handle 30 or 40 acres a day with that in China, where the rice crop is reaped with a little knife as long as the forefinger. Production per man is 10 times greater in the developed than in the underdeveloped countries.

However, what has been good for us will not necessarily be so for them. In many such lands mechanization would probably mean that man would not cultivate more land but that he would work less. (9)

#### **Practically All Underdeveloped Countries Want To Industrialize**

Underdeveloped lands by their very definition need development. And the need becomes more urgent daily, particularly for food because of the appalling



increase in population.

Almost all underdeveloped countries believe the magic wand that can ameliorate their condition is industrialization. In this paper industrialization is synonymous with manufacturing, for most people so regard it today. Defined thusly it means manufacturing with "power tools, large capital investment, sophisticated technology and organization, division of labor, and exchange of goods in a money economy." (10)

We must realize that at least a billion people have emancipated themselves from colonialism and desire more than anything else to escape from the static poverty that has clamped down on their lands for centuries. These people, however, cannot do the job without outside help. Here the Free World and Communism come to grips. John Foster Dulles has warned Americans that the Communists' "cruel system . . . does have a certain fascination for the people of underdeveloped countries who feel that their own economies are standing still."

No one can read the literature dealing with the underdeveloped nations without concluding that by and large representatives of the United Nations, of America's Point Four Program, and of the underdeveloped countries themselves consider industrialization to be the panacea that will solve their economic and social problems. From hundreds of statements dealing with this problem, I quote from but three:

"More and more the peoples of these countries, whether it is Latin America or India, or the Near East or Africa, are interested in a rising standard of living. It has become a symbol to them and quite naturally. The idea of well-being has become widespread and no matter what brought it—whether it was the O. W. I., the Voice of America, or just the G. I.'s that move around the world, or travel and communications—the people of the world are awakened to modern possibilities. The governments of these underdeveloped countries are being pressed by their people to get for them that creative driving force of modern industry and an expanding economy." (11)

"The old preindustrial economy is sick but not dead; the modern economy is still struggling to be born. Here is the unfinished business of the industrial revolution." (12)

"The only solution to our problem is in an increasing industrialization, and it is in the conversion of our agricultural economy to an industrial one, that we come face to face with our social and economic revolution." (13)

#### **Can The Underdeveloped Areas Industrialize In Our Sense of The Word?**

Modern industry is not located equitably over the earth. Certain areas and countries stand out as important concentrations; others are empty or nearly so.

Until recently whether or not a region did or did not industrialize depended on whether it had the bases for manufacturing, (14) (15) whether it could compete with the more favored regions, particularly those rimming the North Atlantic.

Today this is less true. In communist countries, such as China and the Soviet Union, where nationalization has absorbed industry, the leaders are not interested in the people but in national power. Everything else is sublimated to this; in Latin America, Egypt, and Turkey, industrialization is based chiefly, though not entirely, on private entrepreneurship; India is following a middle course. Even in the United States the **Cold War** has to a certain extent dictated the dispersal of industry into many areas that would have not been selected if economic geographic factors alone had operated. (16) Another factor leading to decentralization of American industry has been the effort to avoid the **social problems** characteristic of large concentrated industrial areas.

Many of the underdeveloped lands have little possibility of achieving any major industrial importance because they lack the capital, the skills, the large home market with appreciable purchasing power, the essential raw materials, and mechanical energy, without which there can be no substantial degree of industrialization. Despite all the current publicity regarding the possible use of atomic power for manufacturing in underdeveloped countries, this is no simple and ready solution. So far as eastern and southern Asia are concerned there is no reason to believe that they will or can duplicate the industrial achievements of Western Europe and the United States. Japan which, prior to World War II, had the only industrial concentration in all Asia that even approached that of the West, is not a rich country in raw materials. Today she is much worse off since her empire has been lost. There has been a fuel and power shortage since 1938 and coking coal has always been a problem. With a deficit in iron ore, Japan's steel industry has long been dependent on imports of ore, scrap, and pig iron. Even in copper there is a critical shortage and in petroleum Japan is barely on the long list of producers. Japan will continue to be for the time being, at least, Asia's outstanding industrial nation, not because her bases for manufacturing are strong but because of industrial inertia, the will to live which is based upon trade, and the financial backing of the United States.

What of China? Many reports are highly optimistic of Chinese industrial aims and accomplishments. And like all Communist nations China has a Five Year Plan. According to the terms of the plan the task is to change "China from an agricultural state into an industrial country, because without industry there can be no solid national prosperity and power." (17) China will grow industrially but she has far to go and actually she is almost starting from scratch. All her great plans for industrialization are bound up with the prospects of receiving Russian aid. Soviet technicians are helping and imported Soviet machinery is being installed. Thousands of Chinese are learning modern technology. New factories and mines are opening every month. But modern industrialization requires huge amounts of capital and China is vulnerable here. Soviet loans and grants will supply a portion. The rest must be squeezed out of the peasantry which already lives on the thinnest of subsistence margins. Cressey expresses the situation well when he writes:

"It seems . . . probable . . . that China cannot hope to duplicate the material level of Western Europe or North America. China may overtake Japan, dominate eastern Asia and the Western Pacific, but her resources appear inadequate for world leadership." (17)

From the standpoint of economic geography India holds promise of becoming the leading industrial nation of southern and eastern Asia. Though she has coal reserves that are much smaller than those of China, she has much high-grade iron ore and several ferro-alloys which China does not have in impressive quantities. Moreover, her raw materials for iron-making are mostly in Bihar and Orissa and hence are well located. Of all the countries in the Orient, India alone appears to possess the iron ore and coal, the labor force, the transport network, and the market for a substantial and significant metallurgical development. With a present capacity of 1,200,000 tons of steel ingots, she is making plans to expand this to 6,000,000 tons by 1961 and there is no reason to believe she will fail. With her population of 357 million people, India is also attempting to develop a balanced light manufacturing industry.

Elsewhere throughout the continent modern industry has hardly made even a beginning. Most of what manufacturing there is aside from metal smelting and oil refining consists of the small manufactories of the natives.

Turning to the western part of Asia, the Middle East, we note that there is not a single country that is now important industrially or that gives promise of becoming so in the near future. To be sure politicians and publicists from several of the countries and many sincere students of the Middle East assert that more factories are needed to syphon off the surplus farm population, who now remain on the land, further increasing the number who must earn a living from the soil.

The Middle East, however, lacks most of the major requirements for industrialization. Few areas of the world possess such a slender mineral and material base for industry. Thus what manufacturing there is, is restricted to the light category, factories devoted primarily to the processing of agricultural and pastoral products. No integrated iron and steel industry seems possible unless given generous protection; Egypt and Turkey may develop iron and steel industries, but they cannot be very important. Although petroleum is present in the Arabian Peninsula, Iran and Iraq, the resource plays little or no part in the lives of the masses.

Throughout Latin America accelerated communications have implanted the idea firmly among the poorer classes that their lots could be and should be improved. Their political leaders tell them that industrialization alone can accomplish it.

Yet industrialization from the Rio Grande to Cape Horn is still in the early stages. Actually Latin America produces and uses few manufactured goods and only about 1 worker in 10 is employed in a factory compared with 1 in 4 in the United States. Like all underdeveloped parts of the world, costs of production of all items of comparable quality are higher than in the developed countries. Hence most Latin American manufactures must be protected. "Costs and prices are high because the market is small, and the market is small because costs and prices are high."

Does industrialization give promise of raising the standard of living of the masses of Latin America? An overwhelming proportion of the inhabitants have an agricultural and pastoral heritage and hence have not until recently been much interested in manufacturing. Though Latin America has minerals aplenty, it is not the vast reservoir of untouched mineral wealth that so many people think it to be. Without large and high-grade coal deposits, **heavy industry** cannot go far, despite the fact that seven countries have launched forth on iron and steel projects. In several cases the programs bear little relation to the realities of availability

of private capital and the amounts needed, (it costs \$200 to \$300 million to construct an integrated plant: the recently built Fairless Works at Morrisville, Pennsylvania, with an annual capacity of 2,700,000 tons cost \$500 million), raw materials, technically trained labor, adequate transport facilities, and ample markets. William L. Schurz has put the situation very well indeed:

"Also, the obsession for heavy industry in economically immature countries has led to plans that are far in advance of their present stage of development. After all, Brazil is the only Latin American republic that is ready for a full-fledged capital goods industry." (18)

Industrialization thus does not appear to be the easy or the exclusive answer to Latin America's economic problem. She seems destined for many years to continue in her past and present role of exporter of food, of agricultural, pastoral, and forest products, and of minerals. (19)

#### **Industrialization Sometimes Moves Too Rapidly**

For sound economic growth the underdeveloped lands need balanced development of agriculture, mining, forest industries, manufacturing, trade and transportation, power, health, and education. Too much emphasis on industrialization alone can boomerang and harm the over-all economic development. Investment capital, which is the short item everywhere in underdeveloped lands, should go into enterprises where it will be most productive. In many instances such funds invested in agriculture, mines, or transportation, would produce far greater benefits for the masses than the same investment in industry. In too many underdeveloped lands there has been neglect of agriculture and transportation. Without ample development of the latter no economic enterprise can go far.

Two underdeveloped countries, Brazil and Mexico, moved too rapidly along the road to industrialization. Following World War II Brazil spent \$1 billion more than the total amount of her foreign exchange for machine tools, electric generators, roadbuilding equipment, textile and other machinery. The economy became lopsided, heavy on manufacturing, light on agriculture. She is paying now for this folly.

Mexico too was encouraged by the government to borrow capital, Mexican and foreign. An Aleman cabinet minister said:

We must industrialize; we will starve if we don't. The simple truth is that only some 14 per cent of Mexico is suitable for farming, even if we irrigated to the maximum.

Accordingly, manufacturing was given the green light. What the government failed to realize apparently was the market factor: if 70 per cent of the population is composed of farmers, they comprised most of the market. With almost no purchasing power, they could not buy what the factories were turning out. Hence, Mexico was producing for a "phantom market" - a theoretical rather than an actual one. In his illuminating study of Mexico, Sanford Mosk concluded that highest agricultural productivity was a prime requisite for industrialization. "The Mexican farmer will not be a better buyer until he is a better producer." (20) The present government is once again stressing agriculture, though not neglecting manufacturing.

### Has The USSR Proved That Industrialization Is The Panacea?

Of all the countries in the world none has tried so hard to forge ahead industrially as the Soviet Union. During the interwar period, it carried through the greatest national program of deliberate and planned industrialization that the world has ever witnessed and proved that it is possible for some nations to change from backward agriculturalism to modern industrialism within a single generation. Everything else, good housing, health, agriculture and transport networks, was sublimated to industry. Thus in a third of a century, the Soviet Union changed from an overwhelmingly peasant agricultural country to a well-balanced agro-industrial state. Today only the United States surpasses it in manufacturing.

At present Russia is surpassed in total energy consumed for productive purposes only by the United States and it ranks second in the production of electric power, coal and steel. Steel production and political power go hand in hand. Ours is a steel age. The Soviet Union, appreciating the importance of steel, has stressed the development of heavy industry since the inauguration of the first Five Year Plan in 1928. Steel production has so multiplied that output is now 10 times greater than it was in 1928 and mills are turning out iron and steel across the entire 6,000 miles to the Pacific Ocean. What has made this possible? First the national endowment of coal, iron ore, limestone, and the ferro-alloys has been adequate; second, the government has had the power to determine economic policies and it has been ruthless in wielding this power; third, it has taxed heavily, building up vast funds for industrial development; fourth, Russia received much help and capital equipment from friendly nations abroad and from neighboring countries; fifth, by beginning so late, the Soviet iron and steel industry was able to borrow heavily on the technology of Western Europe and the United States. Hundreds of Americans went to Russia during the late '20's and early '30's. The huge Magnitogorsk combine was built in accordance with American design and direction and for a while was operated by American personnel.

Does the Soviet Union have the reserves and the variety of raw materials to grow in industrial capacity and strength? Indeed it does. By 1950 the mineral output was more than double that of 1944. The huge wealth of minerals in the USSR is shown by Shimkin in his book, **Minerals: A Key to Soviet Power**. So overly ambitious have been Soviet hopes for mineral output, however, that mining achievements, impressive though they have been, have failed to reach the goals set by the government. New discoveries of numerous rich mineral deposits are highly likely because the country has not yet been subjected to thorough geological study, surface mapping, drilling, and geophysical and geochemical techniques. (21)

A major reason why countries industrialize is that they presumably are able to raise their standards of living. Has this been the case in the Soviet Union? The answer is no. Chauncy Harris has pointed out that per capita output of edible animal products has declined by almost a third in the past quarter century and that the per capita level of grain production is about where it was in 1928, that housing in cities has decreased from 64 square feet of floor space per person in 1928 to 46 square feet in 1953, that in spite of industrialization the Soviet Union still has a poorer diet than the underdeveloped nonindustrial countries of southern and eastern Europe. (22) On a per capita basis less textiles are available than in 1913. It would thus appear that so far as the great masses of the Russian people are concerned, industrialization has not raised their standard of living. Russian industry has not been geared at any time to the production of consumer goods: the big investments, four-fifths of the total, have gone into the capital goods industry, and only about one-fifth into the consumption goods industry.

Nonetheless, in many underdeveloped countries where the economic clock has apparently stopped, publicists, politicians, and labor leaders have wondered whether the same approach might not result in raising their standard of living with "modifications to avoid sacrificing the freedom of the individual." The Soviet Union's technique is to picture itself as the champion of the underdeveloped areas.

### **Foreign and Technical Aid: Is It The Only Hope For Industrialization in Underdeveloped Countries?**

All underdeveloped countries are poor and there is a pronounced lack of balance between their populations, which promise to increase rapidly, and their resource deficiency. There is little chance for most of them to emerge from their biting poverty if they have to do it themselves. In every underdeveloped country per capita income is low and normal savings of the people are inadequate to finance a sizable increase in productive capacity. To shortcut the 150 years it has taken the West to "make the kind of society that spreads material benefits through all classes" requires capital in dimensions customarily available only for actual warfare.

This means that if the underdeveloped lands are to industrialize, they must get loans or gifts or both from the developed nations or the Soviet Union. All countries in the early stages of industrialization require the assistance of foreign capital in developing their natural resources, establishing and extending their transport facilities and beginning their industrialization. The United States has taken a leading role in this respect, since it alone has had sufficient capital resources and technical skills to aid the needy nations. It has done so through the World Bank, the Export-Import Bank, and Point Four. Under these agencies new factories are springing up all over the world. And along with the hundreds of millions of dollars earmarked for industrialization have gone thousands of technical experts with machines, seeds, breeding stock, drugs, and all kinds of American "know-how." If the underdeveloped countries are to increase their productive capacities, they must draw upon the technical heritage of the developed countries. Such progress must be expected to come slowly, however, since cultural readjustments meet resistance, particularly in predominantly agricultural lands.

The developed nations have been meeting competition recently, too, from the Soviet Union in supplying aid to the underdeveloped lands. For several years the Soviet Union opposed the work of the United Nations technical assistance program. It is believed that the reasons for her complete reversal are, first, that she realizes that the West has benefited, and, second, that it is only recently that she has had sufficient technical manpower to participate in work outside her own orbit.

There are those who doubt whether even the United States can continue its present spending for military purposes, welfare statism, and economic aid on a world-wide basis. Moreover, unlimited help to suffering people abroad may be detrimental to them. Indiscriminate aid abroad could create problems faster than it could solve them. We would be teaching millions to depend upon us, thereby relaxing their own efforts. Warren S. Thompson flashes the red signal before Americans when he writes:

"When we talk of help for these areas, we must consider carefully what we mean. Is it helping people to give them something to live on today when more of them will have to die tomorrow? Currently the people of India need help. Those na-



tions of the Western world which are able must do what they can to alleviate India's food shortage. But we must not be deluded into thinking that this will solve India's problems of food and population." (23)

I sincerely believe that when the developed nations, particularly the United States, embark upon a program of using our fast diminishing resources to raise the world standard of living in peace times, we are attempting the impossible. The task is too big. We can and are giving, freely of our agricultural "know-how" and this will improve the food situation locally until the increase in population catches up. Underdeveloped countries individually must learn to work out solutions to their own specific problems and above all to practice thrift. To a degree they apparently do not realize, they will have to help themselves.

It would appear then that if the industrialization of underdeveloped countries is to be dependent upon foreign financial aid, they will not become industrialized because the developed or advanced nations cannot meet such huge demands for capital.

#### CONCLUSION: Is Industrialization the Panacea?

The Western world's transition from agrarianism to industrialism has been singularly successful. Great Britain's shining example of transition through the Industrial Revolution functions as a beacon before the starry-eyed, impractical politicians, publicists, and bureaucrats of the underdeveloped countries and of many even in the developed nations. They believe that what Great Britain did they too can do. They fail to realize the extent to which the world has changed since then; no country ever again can repeat what Britain did.

Modern industry cannot be superimposed upon a feudalistic society. Under feudalism the prestige of holding land diverts resources to uneconomic uses and national income is low and inequitably distributed. No country should pattern itself precisely after another for each has its own peculiar demographic, economic, geographic, political, and social problems: there are, for example, more dissimilarities than similarities among the 20 Latin American countries.

In nearly all underdeveloped lands industrialization as the panacea is limited by lack or paucity of fuel and power, by low wages, dearth of skilled workers, limited and all too frequently poorly developed transport, scarcity of capital and unwillingness of local capital to invest in manufacturing; hostile or at least unfavorable climates, lean raw materials base, and all kinds of social obstacles and man-made economic difficulties. Of the last the caste system of India and the organization of Chinese and Latin American society whereby certain classes will not work with their hands are examples.

Students of industrial geography ought never lose sight of the fact that neither undue ambitions of the underdeveloped countries nor the unbridled enthusiasm of certain individuals and groups in the advanced nations should be permitted to overcome sound judgement. There can be no doubt that the underdeveloped countries not only are obsessed with the idea of industrialization, they also are **determined** to industrialize. Many accordingly have embarked on ambitious projects without adequate information regarding the bases upon which the success of such projects rests. In doing so, from the standpoint of their social standards, they may elect to pay, in many instances, somewhat higher prices for their own manufactures than would be the case with the same or perhaps superior imported goods. Certainly this is true in Latin America today.

Many of the underdeveloped countries are "naturally and finally poor" and hence are doomed to a continuation of their present awful poverty. No nation, however, starves quietly. And for some decades the only alternatives to starvation are war, which we certainly wish to avert, financial and technical aid, and birth control. Of these several possibilities, the one that seems to make the most sense is birth control, for population is increasing fastest in the very countries that suffer the greatest economic handicaps and in the future they will have to support a still larger proportion of the world population. Some governments, realizing that high birthrate is a great detriment, are beginning to do something about it. India is probably the best example. Until the population problem in the underdeveloped countries is faced squarely, much of the discussion of improved living through industrialization is academic. But here, social, economic, political, religious, and educational hurdles block the way. The resource base is relatively fixed, but population is largely subject to control by man. **We must, of course, never lose sight of what new discoveries and new technology might do.** The possibilities of nuclear and solar energy are only beginning to be realized: it is not illogical or impossible that either or the two together might result in the redrawing of the industrial map of the world. Birth control appears to hold the most promise for raising the level of living, but the route to a lessening of the pressure of population is strewn with many barriers. Were birth control to be practiced universally, numbers could be limited so that mankind might avoid both want and war. However, to get it universally adopted would in all probability take much time and would likely give rise to many new problems.

I believe that most of the underdeveloped lands lack the favorable population-land-natural resources ratio that Western Europe had as it launched forth on its Industrial Revolution. I agree whole-heartedly with the following premise of the Hoover Commission:

"Industrial projects should not be undertaken in countries which do not already have an industrial background. In these countries there is little local capital available for participation and the vast background of transport, marketing, technical and executive skills is lacking. Large industrial projects cannot succeed against this background and in any event cannot affect the standard of living for many years to come. Such projects are not the answer to unemployment. American industrial experience shows that in large manufacturing, the capital investment of \$100,000,000 or even more is required to provide ten thousand jobs.

In the "Asia-African arc" with the possible exception of Japan, no manufacturing or large industrial development projects should be undertaken and industrial aid should be confined to small industries." (24)

I believe I have made it clear that industrialization *per se* is not the panacea for improving the lot of three-fourths of the world's people. The problem of the underdeveloped lands is probably the most difficult one before the world today and will require decades, generations, maybe even centuries to solve. Possibly not a single one of the underdeveloped countries is ready for the degree of industrialization to which it aspires. It is a task, almost an impossible one, to develop modern industry in a predominantly agricultural country, where the level of living is low and where there is little capital. And this is true even if the country be richly endowed with minerals and energy. Thus industrialization is the panacea only insofar as it is the **dynamic and driving force** behind a program of total development involving all phases of human activity.



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## TREE FARMING IN THE DOUGLAS FIR REGION: AN EVALUATION

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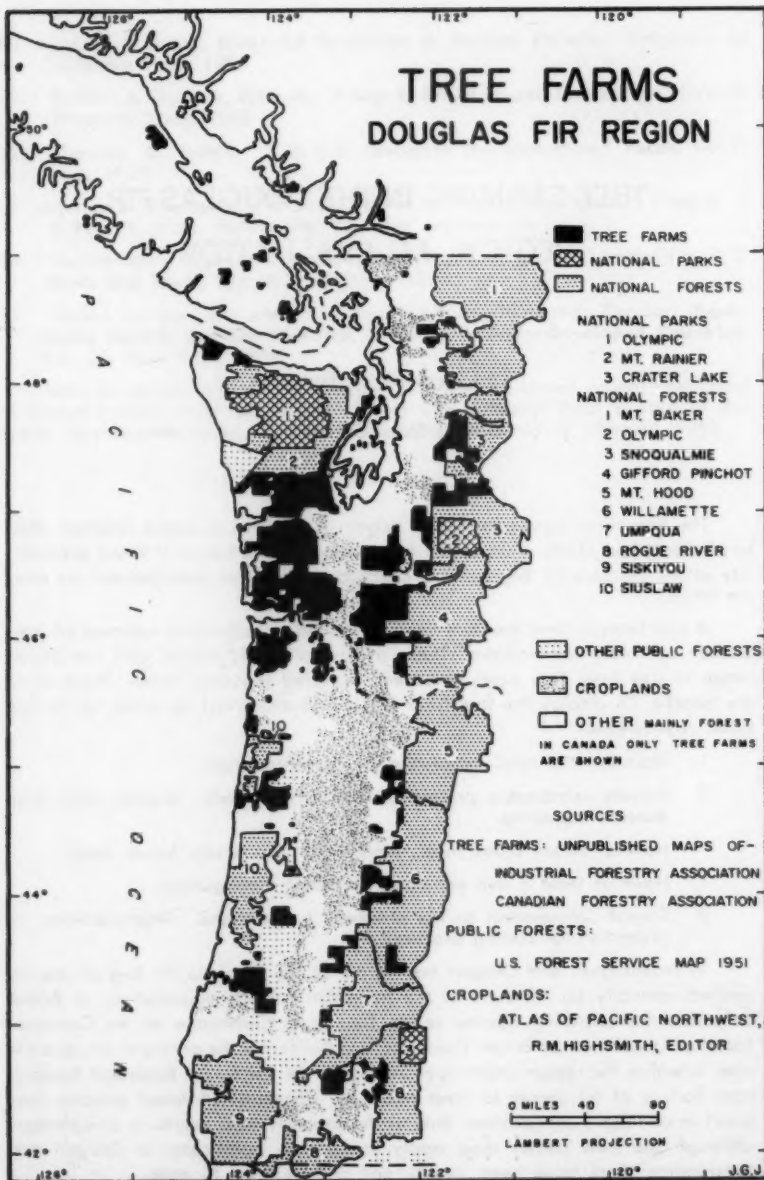
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The tree farm movement which began in 1941 as a public relations idea has become one of the most potent forces assuring the future of forest productivity in the Douglas Fir Region. It is certified evidence of management on private lands.

A tree farm is land that has been dedicated to continuous commercial production of forest commodities. There is no size qualification and tree farms range in size from four acres to several hundred thousand acres. There is no tax benefit. To display the tree farm label an owner must be living up to five basic requirements.

1. Maintain the land for production of forest crops.
2. Provide reasonable protection from fires, insects, disease, and from excessive grazing.
3. Harvest timber crops in a manner that will assure future crops.
4. Have at least a five year plan of forest management.
5. Furnish information on his progress, future plans, improvements in protection, or cutting practices.

In Washington and Oregon tree farms of the Douglas Fir Region are inspected annually by foresters of the Industrial Forestry Association. In British Columbia the certifying agency is the Tree Farm Committee of the Canadian Forestry Association of British Columbia. In California the principal Douglas Fir area is within the region under sponsorship of the California Redwood Association. Failure of an owner to meet minimum standards of forest practice may result in certificate cancellation. Sale of the property also results in cancellation, although the new owner may apply for a new certificate. In Oregon and Washington there have been twenty one cancellations to date.



### Beginning and Growth

The term "Tree Farm" was first used to include 120,000 acres, just south of Elma in Western Washington, about half of it belonging to the Weyerhaeuser Timber Company. Here on a large area of cut-over land, repeated fires, mostly caused by hunters and berry pickers, were interfering with regeneration of the forest. Finally in an effort to gain public cooperation in a program of fire control, the idea was conceived to call the area a "Tree Farm." The term was an inspiration which spread throughout the nation and has done much to help the public and the forest owners appreciate the nature of forest land management. In the Douglas Fir Forest Region most of the forest lands managed under the tree farm certificate are in Western Oregon and Washington. Recently the movement has spread into the Douglas Fir area of British Columbia and northern California.

**Washington and Oregon** — In 1942, 16 tree farms, including nearly two million acres were certified in Washington and Oregon. Since then growth has been steady. In 1955, 185 tree farms include nearly 4½ million acres. Three types of properties are recognized: 1, Industrial properties owned by various segments of forest based industry, 2, investment properties, and 3, farm properties.

Eighty two industrial properties under 46 ownerships account for 98 per cent of the area. They average nearly 100,000 acres per ownership and about 56,000 acres per tree farm. Pulp-paper and integrated companies which produce more than lumber, hold 60 per cent of the industrial properties, an indication of the compelling concern for the future felt by companies having large capital investment in established plants.

There is an encouraging and significant acceleration in interest by small forest owners. In the past two years over 90 non-industrial properties have been certified. Many are managed by firms of consulting foresters who make a business of serving a number of small tree farms. Others rely on assistance from the Farm Forester provided by the Federal Cooperation Extension Service. This trend is of major importance because it is mostly the small ownerships that remain to be brought under management practices such as the tree farm implies. There are over 40,000 farm ownerships totalling nearly 2,000,000 acres and about fifteen thousand non-farm ownerships with under 5,000 acres each, totalling about 5,500,000 acres. [1]

In the Douglas Fir Region of Oregon and Washington about 50 per cent of the commercial forest land is in public ownerships, and about 50 per cent in private holdings. Of the private lands 34 per cent is now in certified tree farms.

Washington has 60 per cent of the total tree farm area. Here early acceptance was favored by several factors. The accessible forests were cut early before major production began in Oregon and lands are in large company holdings. Physical conditions favor forestry, the terrain is generally of low relief, large areas of droughty soils are unsuited to agriculture, and the waterways and roads provide accessibility.

The distribution pattern is mainly a function of public ownership, public lands are excluded and acceptance of the tree farm program by private owners is voluntary. In Washington two tree farm areas are outstanding: 1, Southwestern Washington from the Olympic National Forest south to the Columbia River, 2, the Cascade foothills, especially from the Lewis River north to east of Seattle. Other tree farms are in scattered small blocks with the largest on tidewater areas of the Olympic Peninsula.

In Oregon the slower development may be attributed to a number of factors: the terrain is generally more rugged, accessibility is not as favorable, the industry is less mature, and big company operation is newer. Three areas stand out: 1, The Pacific Coast Slope, especially in the north along the Columbia River east to Astoria, near Tillamook, in the Siletz drainage, and in the Coos Bay area, 2, on the slope of the Cascade Mountains bordering the Willamette Valley, especially in the McKenzie River drainage tributary to Eugene-Springfield, 3, south of the Willamette Valley in three general areas, the Willamette Fork drainage around Oakridge, tributary to Cottage Grove, and in the Upper Rogue River drainage.

Tree farms in both states generally are on the lower elevations and the more accessible areas. In contrast the National Forests and other public lands mostly occupy the higher slopes. However, tree farms are not strictly limited to the better growing sites. The Simpson Company, for example, has a large area of site four in its tree farm area, but it is readily accessible, close to market, and regeneration is notably good. In the future as foresters learn more about tree growing, private companies will tend to be more selective in choosing lands on which to spend money growing trees.

**British Columbia**— The tree farm movement began in British Columbia on May 21, 1954 with certification of 9,774 acres of forest land near Haney, owned and managed by the University of British Columbia. Since then twenty one farms comprising 188,638 acres have been certified. Three of them are over 25,000 acres, the 61,116 acre tree farm of the Elk Falls Company Ltd., the 32,565 acres of watershed forest managed by the Greater Victoria Water District, and the 29,534 acre Cowichan Tree Farm of the Western Forest Industries Ltd. Nine tree farms contain less than 500 acres and the smallest is only 50 acres. Eight additional forest areas are currently being inspected and may soon be certified. In contrast to the situation in the United States, the Provincial Government encourages private management by a modest tax advantage. Under the 1951 amendment to the Provincial Taxation Act, tree farms are taxed on their productive capacity rather than on value of timber, and the rate of tax is one per cent instead of three per cent assessed on other forest lands. It is evident that the tree farm movement is beginning to play an important role in the Douglas Fir Region of British Columbia and that it is reaching the small forest owners as well as the large industrial ownerships.

**Northern California** — The Douglas Fir Region extends into Northern California especially along western mountain lands lying just inland from the Redwood Forest Belt. This area of dominantly Douglas fir is the eastern portion of the Redwood Forest Region and is mostly tributary to U. S. Highway 101. Logging of Douglas fir in the area was of minor significance until after 1940 when the southward migration of the industry reached Northern California. Today, the annual Douglas fir cut in northern California exceeds Redwood production.

Tree farms in the Redwood Forest Region have been certified since 1950 by the California Redwood Association. There are now thirty two tree farms including 218,705 acres, but only six tree farms are dominantly Douglas fir and total only 4,239 acres. All but two of the thirty two tree farms are in the three coast counties of Sonoma, Mendocino, and Humboldt.



### SIGNIFICANCE

The significance of the tree farm movement lies first in its public declaration of an industry attitude toward forest land resource, and second in the hope and expectation that most private forest lands will come under this enlightened stewardship. Using only the Oregon and Washington data, for statistical purposes, the potential importance of tree farming is indicated by the following assumptions. The thirty four per cent now enrolled is no doubt the easy portion. However, it is reasonable to assume that seventy per cent of the 13,000,000 acres of private forest lands in the Douglas Fir Region will come into the program, to make a total of about 9,000,000 acres in tree farms. These lands will then all be managed on a level higher than minimum intensity. With no increase in technology an average annual growth of between 500 and 700 board feet per acre can be expected, which will support an annual sustained yield harvest of between four and one half and six billion board feet of timber. A harvest of this size would require annual clear cutting of only one per cent of the projected 9,000,000 acres, assuming an average crop of 50,000 board feet per acre. To this can be added the increasingly important intermediate harvests for pulp wood, poles, and other salable commodities, perhaps a billion board feet per year. The total annual harvest from tree farms alone would be somewhere between five and one-half and seven billion board feet. This would be fifty five to sixty per cent of the expected annual production in the Douglas Fir Region of Oregon and Washington coming from tree farms occupying thirty five per cent of the total public and private commercial forest area.

### CONCLUSION

Tree farming has grown out of a combination of many circumstances. Undoubtedly the most important is the gradual ending of the era of logging virgin forests making it essential and profitable to grow trees. Also of major importance was the need felt by industry to counteract the trend toward public ownership.

The immediate forerunner of the tree farm movement was article ten of the NRA lumber code of 1933, written by the industry and pledging its members to leave seed sources on cut-over land. At that time large areas were reverting to public ownership through tax delinquency, and there was a rising tide of sentiment and active forces moving toward public ownership as the only way to assure forest production for the future. The tree farm movement is the answer of private industry to the threat of increased regulation and public ownership of forest land. It is a remarkably successful effort of private forest owners not only to establish intensified forest management practices in their own self interest, but also to inform the public of their acceptance of responsibility for resource stewardship.

Tree farms are concrete evidence of the transition from the youthful industry era of logging virgin forests to a more mature stage, characterized by management of forest lands for timber production. Until recently the Douglas fir industry has been able to profit most by harvesting without spending much money to grow trees or manage existing forests. Times have changed. Large areas of merchantable timber on private lands are seldom on the open market and timber from public lands is generally sold at auction to the highest bidder. Thus an industry organization wishing to assure an ample and

continuous source of timber must own and manage forest land sufficient to supply a reasonable share of their requirement. Just as in every other facet of the American private enterprise system, forestry is a business in which intensified management practices are applied when it pays. This is no new idea. In April, 1898, the following appeared in the magazine "Forester." "Forests will be managed properly and reproduced when it pays to do so, and love of trees and zeal for the beautiful will have as little to do in this business of wood cropping, as love for the waving field and the beauty of the tasseled corn is the incentive to the farmer to plow and sow." The success of the tree farm movement is evidence that that day has come!

#### NOTES AND TABLES

1. The 1945 U. S. Forest Service Re-appraisal data yields these figures: 43,173 farm ownerships totalling 1,951,000 acres, 15,144 non-farm ownerships of under 5,000 acres each, totalling 5,289,000 acres.

TABLE 1

#### OREGON AND WASHINGTON TREE FARMS

##### Douglas Fir Region

End of Year	Acres	Number		
1941	120,000	1		
1942	1,872,919	16		
1943	1,872,919			
1944	2,045,437			
1945	2,046,655			
1946	2,196,831			
1947	2,524,693			
1948	3,014,141			
1949	3,270,692			
1950	3,677,710			
1951	4,010,302			
1952	4,085,048			
1953	4,250,476	203		
1954	4,415,430			
1955 (June 1)	4,469,542	285	169 in Washington	2,680,755
			116 in Oregon	1,788,787

Table 2

#### INDUSTRIAL TREE FARMS 1953

Type of ownership	ownerships	properties
Lumber	16	18
Pulp-paper	6	21
Integrated	12	29
Logging	5	7
Non-operating	7	7
	46	82

Source—Industrial Forestry Association



## RAM PASTURE AND WALLPAPER:

A Story of the Uranium Boom in the Colorado Plateau

Elbert E. Miller

University of Utah

### The New Boom

The most spectacular growth to hit the Colorado Plateau since its sparse settlement in the 1860's and 70's is the one which is now taking place. Everywhere one sees evidences of this expansion and a grab for quick wealth. The hundreds of mobile homes, tents, shacks, and even a number of new, substantial houses, the mushrooming towns, with their dozens of new businesses to serve the public, the new road system stretching across the rugged terrain like an ever-growing octopus, these are the readily observable aspects of the development.

But there are numerous other, less observable, aspects of the boom. First, it should be noted that the mining of uranium in the Colorado Plateau is **not** a recent development. A few years before World War I, about 1911\*, uranium mining began, to supply contracts with Rare Metals Company and Standard Chemical Company. The companies were supplying uranium and radium for experimentation and medicinal use to doctors and laboratories in eastern United States and in Europe. There are stories, probably false, among the old-timers on the Plateau that Madame Curie received rare metals for her experiments from the vicinity of Naturita, Colorado. Other stories place the source at Moab or Hite, Utah.

Stories indicate that uranium mining was begun in the vicinity of Naturita and later spread to other areas. The ore was packed on mules to the roads and freighted out on wagons. With the fulfillment of a contract, mining would cease until another contract could be obtained, sometimes a period of a year or two. Naturita, Uravan, and other towns associated primarily with mining thus went through half a dozen or more periods of boom and bust previous to the Depression of the 'Thirties.' In 1929, for example, Naturita had only 30 inhabitants and post office cancellations were frequently less than 15 cents per day. Last year receipts were over \$8000. In 1930 the

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\*Because of the nature of this paper, no formalized footnotes are included. Personal observations, interviews, *The Wall Street Journal*, and *Salt Lake Tribune* are major sources.

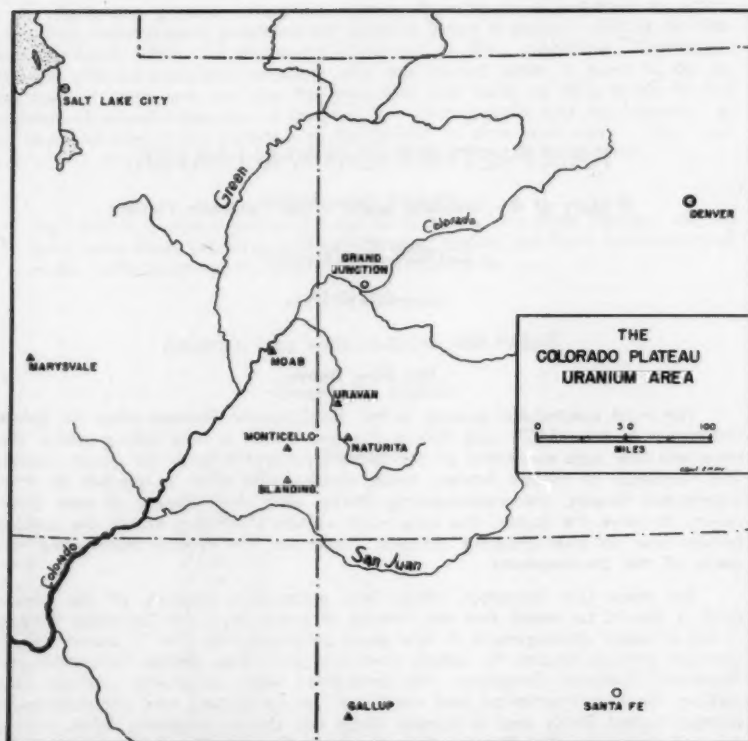


Fig 1. The Uranium Producing Area of the Colorado Plateau.

Naturita mill opened to process vanadium ore with radium and uranium as the not-too-valuable by-products, even as gasoline was not very valuable in the early period of petroleum refining. Population and employment were a little more stable at Uravan where a small mill was built in 1912. In 1919 this mill was sold to U. S. Vanadium Corporation, enlarged to 50 tons per day capacity, and changed to a wet-process mill. These mills only concentrated the rare metal content. The concentrates were then shipped to Canonsburg, Pennsylvania, for further refining. Emphasis was on vanadium until World War II. With the greater demand for minerals to develop the Atomic Bomb, in 1942 the Federal Government built a housing project for about a hundred families between the towns of Naturita and Uravan.

Population and employment were more stable in the other towns of the Plateau during this early period, since they were almost entirely dependent upon subsistence farming and/or cattle and sheep ranching. Thus the influx or departure of a few dozen miners had little effect upon the economy. At Marysville, on the western edge of the Plateau, is the nation's only lode mine for fissionable materials. Several ores of radioactive minerals, such as uraninite and autunite, plus the more common lead, zinc, silver, gold, and alunite have been mined at various times. Though Marysville is somewhat in the doldrums today, depletion of ores is not responsible but rather the cheaper cost and great volume of fissionable materials from the main portion of the Plateau.

Today, population growth is one of the most noticeable items within the 107,000 square miles of the Plateau. A rush as big as the Klondike gold rush is developing. There are some differences (besides the material aspects of a twentieth century civilization rush) that can be noted between this boom and many earlier gold rushes, however. The first item of interest is that the boom has hit different towns in the area at different times. The earliest towns to experience growing pains were the larger ones which are located around the margins of the plateau. These naturally became supply and outfitting centers for prospectors and miners. Thus, Grand Junction, first, then Grants, Shiprock, Farmington, and Moab, and now Monticello, Green River, and to a lesser extent Blanding, are feeling the pressure of added citizens. Grand Junction grew from 12,500 in 1940 to 14,500 in 1950, and to about nineteen or twenty thousand today.

Table 1

	1940	1950	1955(Est.)
Grand Junction	12,500	14,500	19,500
Moab	1,174	1,274	5,200
Monticello	667	1,175	2,500
Blanding	1,111	1,175	1,500

Before the boom hit, Moab gained only a hundred citizens in 10 years to reach 1,274 inhabitants in 1950. But last year alone it had a growth of over 300 per cent, so that its estimated population today is about 5,200. Monticello, as an example of the most recent boom, gained 25 mobile home families in the first two weeks of June 1955, and expected 75 more in the following three weeks. Its 1950 population of 1,175 was only 100 less than that of Moab, but today Monticello's population is estimated at 2,500 compared to Moab's 5,200. Blanding's population is just beginning to rise. Its population remained virtually unchanged from 1940 to 1950 with 1,175 inhabitants. Today, it probably has less than 1,500 with only a few dozen living in trailer homes. Now let us examine each of these centers in greater detail to show its problems and attempts at solution.

### Grand Junction

Grand Junction is the site of a divisional headquarters of the Atomic Energy Commission, and is by far the largest of the cities serving the Colorado Plateau. As such, its growth has been far less, percentage wise, than that of any other city serving the area. In actual numbers the increase of 7,500 people is greater than in other centers, but it is the percentage increase that determines the significance of the impact. Thus, Los Angeles gains 500 inhabitants daily without any apparent difficulties connected with the growth. On the other hand, Grand Junction has very serious problems confronting it today because of a 15 year growth of 7,500 people. Housing, the first problem, is so acute that people were using hotel rooms for offices until a 7-day limit was placed on guests. The conversion of the Holly Sugar Factory into a uranium mill has increased the demand for living space. The second of several serious difficulties facing Mesa County inhabitants today is the supply of culinary water.

As in most arid regions, all suitable and available water has already been appropriated either for irrigation or culinary use. Thus, the 1,500,000 gallons per day needed to supply these new residents is unobtainable. Grand Junction's municipal water problem is complicated by the fact that there is no single unified water company supplying water to the city and suburbs, but rather there are several companies, each supplying a section of the urbanized area. As new subdivisions are formed, the companies have often, in the past, drilled wells or brought water from the surrounding mountains to their subdivisions. The lines frequently cross or parallel existing lines, usually with each being only of sufficient size to supply the homes already connected and with no provisions for growth. Some subdivisions have only a  $\frac{3}{4}$ " water main to the entire group of homes.

The third serious and expensive difficulty facing Grand Junction today is sewage disposal. The plant was built to supply a city of 15,000, and is satisfactorily serving all within the city limits. However, the subdivisions being built, some at considerable distances from the disposal lines, have no means of connecting with the existing plant and its lines. Consequently, most subdivision homes are being connected to septic tanks. With the combination of small lots, virtually impervious clay subsoil, and a high water table, it is easy to see that a serious health situation has been created.

Both the water and sewage difficulties might have been prevented if the county had enacted a subdivision law about 15 years ago. The County Commissioners are now trying to enact such a law along with the establishment of a City and County Planning and Zoning Commission. This committee would have the power to prevent greedy landowners from establishing a subdivision merely by driving stakes in the ground and selling lots. With the demand for lots so great, "There is a sucker (buyer) born every minute."

### Moab

The city of Moab had a subdivision law as do all counties in Utah, so it has not had to cope with the same difficulties which face Grand Junction. In 1948, Moab officials bonded the city and established a new water system and installed a sewage disposal plant. Since the city had experienced virtually no growth in the previous decade, the city engineer recommended that water and sewage facilities for a city of 2,200 would be sufficient. Hardly had the streets been resurfaced when the discovery of oil about 125 miles to the north, natural gas 100 miles west, and increasing discoveries of uranium to the east, south, and west caused an influx of residents. The 6-inch sewer mains naturally were too small to serve 2,000 connections, because they were only designed for 500 homes. Sewage backed up in the manholes. Reservoirs could maintain only one day's supply of water in January, 1955. A large fire would have destroyed the city. The city was already bonded to the limit. A request was made to Washington D. C. for aid on the grounds that the emergency was at least partly created by national defense and the Atomic Energy Commission. The request was denied. A new study of the city showed 640 families living in mobile homes, tents, shacks, or other non-permanent housing, and only 480 families in permanent homes. A study by the Utah Employment Service indicated that 1,054 additional employees would be required by December, 1955, and after the uranium mill is in operation, about 3,200 people would be in permanent employment in Moab. It might be mentioned for comparison that there were only 778 employed in Moab in June, 1950. With this information, Congress granted \$160,000 to Moab in May, 1955, and work has begun on sewage and water lines. Moab has also enacted a 2 per cent city sales tax to help pay increased city costs.

### Monticello

A government-owned uranium mill has been operated in Monticello since 1942 by the Gallagher Company of Salt Lake City. Therefore, the extreme growth seen in Moab will never be experienced in this San Juan County center. When the mill was built in 1942, the city officials and the Gallagher Company could not agree on water rights, prices, and installation costs, so the company drilled four wells to supply the several thousand gallons needed daily at the mill. The city obtained some 3 inch boiler tubing under a National Defense Emergency Permit and installed it at that time. With the present population about 300 per cent over the 1942 figure, these water distribution lines are not large enough to supply needs. And as might be guessed, they are also so rusted that they are continually developing new leaks. The mill capacity is now being doubled and the company is drilling two new wells to supply water needs. Monticello has also been denied aid once by the Federal Government, but is submitting another request.

### Blanding

Blanding is the typical Mormon rural community. With a stable population of about 1,100 people who live in their widely spaced homes in the town and commute to their farms, the wave of prospectors and miners passing through to the surrounding plateau areas has hardly affected the economy except as concerns the sales volumes of the local gas station and cafe. A sewage system was recently installed and everything appears rather quiet and humdrum. There are probably not more than 25 mobile or other non-permanent homes in the town.

### General Commentary

It can easily be seen that adequate foresight, studies, planning, and laws might have prevented some of the problems of the individual municipalities. Other problems which are common to boom towns, such as robberies, burglaries, prostitution, drunkenness, fighting, and similar lawlessness could not have been prevented by such measures. Even a shooting, as a result of claim jumping, occurred with this Twentieth-Century Uranium Rush.

Adequate housing in the area is impossible even for those who wish to buy or build. The banks which loan money for home construction, guaranteed by F. H. A., have sufficient demand for their money in Denver, Salt Lake, Los Angeles, and other centers which are admittedly permanent. Thus, they have neither need nor desire to invest in homes in towns which may fold up in 1962, long before the homes are paid for. Therefore, many people with  $\frac{1}{3}$  to  $\frac{1}{2}$  the purchase price as down payment cannot buy or build. This, naturally, increases the housing problem.

What is the future of the population growth? Is the boom temporary, or will these people be a permanent part of the Plateau landscape? The mines are not noticeable as one travels the main highways through the Colorado Plateau, since these routes are located on the more level land and the mines are located in the canyons and along the fault scarps where the underlying Shinarump and Chinle formations outcrop. Ore production has been doubling every 18 months since 1949 and ore is now being mined on 1000 claims compared with 800 producing claims only six months ago and 630 in 1953. About 125,000 mining claims, most of them for uranium, have been filed in Utah since 1946, 90 per cent since January 1952. Probably an equal number were filed in Colorado. Admittedly, most of them are **Ram Pasture**, that is, without uranium. Ram Pasture is a local term for worthless grazing land. The San Juan County, Utah, Recorder is now ten days behind in his filing of claims and proof of assessment work, and has three typists in the hallways of the Courthouse for lack of other space.

Among the world's big uranium producers of Canada, Belgian Congo, and South Africa, the United States is competing for first place, but Raw Materials Chief, Jesse Johnson of the Atomic Energy Commission says that it will take ten years to build up a safe stockpile. Mr. C. F. Powell, British Nobel Prize winner in Physics says that the U. S. has 4,000 fission bombs and the Soviet Union has 1,000. However, Eugene Ayers of Gulf Research says that uranium may already be on the way out in favor of hydrogen fusion for power. But a new Atomic bomb now has the power of 10,000 tons of TNT.

It is common knowledge that the Federal Government will cease buying uranium ore in 1962. Even as recently as a year ago, there was considerable pessimism associated with that date. But today, most people feel that conditions will be better after 1962, because private industry will be able to buy and use fissionable materials at that time.

It should be noted that a new phase of exploration is underway now. Most of the surface deposits have been located, so that the private prospector is giving way to the large company which can supply housing, and carry on aerial survey, drilling, and geological study. Today the cost of locating a deposit often reaches \$20,000 to thirty thousand. This is frequently supplied by group pooling of resources, or staking claims and then organizing a com-



pany to sell stock, with the geologic prospectus sometimes written by college sophomore geology students. The money from sale of stock is used to core drill or tunnel to locate ore. Since 1948, 140 companies have been organized in Utah. Only 47 are now shipping ore. Most of the stock offerings are under \$300,000 each, but these small companies have raised 48 million from the public. Par value of stock has most frequently been one cent, although some have been valued as high as one dollar. Many of these small companies are merging because of lack of sufficient funds to develop claims. For the above reasons, probably half of the stock is **Wallpaper**, that is worthless, and similar to older types of speculative mining stock. In spite of close checking by the Utah and Colorado Departments of Public Securities, all uranium mining is a big gamble and there are always shyster companies.

Notwithstanding the many small companies, it should also be mentioned that all the major American mining companies are in the uranium business—American Smelting & Refining, Homestake, Anaconda, New Jersey Zinc, Phelps Dodge, Calumet and Hecla, Rochester & Pittsburg Coal, and El Paso Natural Gas to mention only a few.

Mining is now employing many more men than exploration. But no one has yet claimed Atomic Energy Commission's offer of \$10,000 bonus for the first company to deliver 20 tons of 20 per cent ore. Most ore runs less than 0.5 per cent, for which the owners receive \$44.50 plus \$35.00 bonus on the first 10,000 pounds of uranium oxide content plus an allowance for hauling the ore to the mill. Bonus payments have been averaging \$195,000 monthly during early 1955, for a total of over \$5 million since March 1, 1951, and 538 claims have been certified by A. E. C. as eligible for bonus payments. But only 91 have received payment for the full 10,000 pounds of mineral.

Mills are located at Salt Lake City, Grand Junction, Naturita, Uravan, Durango, Shiprock, Grants, and Monticello. A contract has been let for a mill at the Moab buying station and others are under consideration at Green River and at numerous cities outside the Plateau. Most of the mills employ 75 to 150 men when in operation. Because of the different types of ore, most mills can handle only one or two uranium minerals. But all ore is bought, sorted, tested, stock-piled, and then shipped to a mill which can handle that type. Hence, transportation is a tremendous item in the industry.

In summary, the uranium industry seems to be entering a new and more stable phase. And the development of the oil and gas industry gives a steadying influence to the present boom. The people who are getting richest from the boom are more likely to be in the stock brokerages in Salt Lake City than those digging for the pot of uranium at the end of a rainbow.

## THE ROLE OF PEMMICAN IN THE CANADIAN NORTHWEST FUR TRADE

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This paper is an informal account of one rather interesting segment of the economic and historical geography of Canada. It relates only the significant use of pemmican as a food among fur traders, and makes no effort to discuss the fur trade of the Canadian Northwest. No detailed citations to the literature are made in the text, but a list of representative sources consulted is appended. Pemmican is a Cree Indian word for a highly concentrated food consisting of dried meat, pounded and mixed with fat, and used by the northern Plains Indians as their staff of life. Among other northern and western Indians pemmican was sometimes made of venison, elk, reindeer, or salmon, but the Plains Indians used only the meat of the buffalo, and in this discussion "pemmican" will be understood to mean buffalo pemmican.

Among Plains Indians the pemmican supply was traditionally packed in the summer following large scale buffalo kills. Choice lean meat was cut in wide, thin strips or sheets and dried in the sun and wind, or occasionally over smoke. When completely dried it was placed upon a hide pegged to the ground and beaten with flails, or ground between stones, until reduced to a mass of fibers and powder. Marrow and fat were rendered and added to the shredded meat in the proportion of 50 pounds of meat to 40 pounds of melted fat. The mixture was then packed in buffalo hide bags and the mess cooled and hardened as pemmican. Sometimes dried fruits such as wild cherry, service berry or, later, a few pounds of sugar were added to improve the flavor and quality. Prepared in this manner the product seldom became tainted or rancid, even after years of storage.

Peter Pond and the Frobishers were among the first white men to appreciate its significance as a provision, in the late 18th century, and for half a century it became the main subsistence food of those men and their families who manned the fur brigades of Canada's northwestern frontiers. Today its traditional significance has almost been forgotten, and the most recent reference in the indexes to periodical literature dates back to 1902. Yet during the first half of the nineteenth century pemmican supported a fur trade empire and played a vital role in economic control over the vast plains and northern forests of Western Canada. So significant was it as a frontier ration that when its use ended, with the decimation of the buffalo, one might venture to say that the old order of the fur trade empire fell with it.



It was the Northwest Company from Montreal that first made commercial use of pemmican. For travel by canoe into remote river districts where the most valuable furs were to be obtained, a concentrated, easily kept provision was needed, as in this area it was impossible to live consistently off the land or obtain supplies from the scattered Indian settlements. For provisioning under these conditions pemmican proved ideal. It would pack easily in canoes, and in a ventilated cache, summer or winter, it would keep almost indefinitely. Any group, company, or economy that could effectively utilize pemmican had a distinct advantage in this far-flung trade empire.

Pemmican has been called the greatest of all concentrated foods. It provided a complete diet, and as it was already cooked, in a manner of speaking, by sun, wind, and hot fat, it could be eaten raw or cooked in a number of ways. In food value a pound was the equivalent of four to eight pounds of fresh meat, fish, or wild fowl, and it needed no medicine to correct a constant use of it as food. Thus pemmican became an indispensable provision for the travelling trader who had to move constantly.

The largest source of pemmican was the area of the Red River Valley near present-day Winnipeg. In the summer of 1800 Alexander Henry, an employee of the Northwest Company, set up a post at the point where the Park River enters the Red, and where a salt seep attracted buffalo and other game. Henry and his company engaged in several killings that fall and the following spring, and made up the meat according to the Indian formula. When he broke camp in May of 1801 he took back to headquarters at Grand Portage about 5000 pounds of pemmican. Later that summer he constructed a permanent post on the Pembina River and for the next eight years the Northwest Company depended upon Henry for a large part of its pemmican. From 1800 to 1808 the company utilized approximately 21,000 pounds.

Although reference thus far has been made only to the Northwest Fur Company, competition among fur companies had been keen and merciless for three decades or more in the far northwest prior to 1810. Soon after the Northwest Company started operations on the frontier the Hudson's Bay Company followed and as early as 1774 was attempting to meet competition by establishing frontier posts of its own. Nor were these two companies fighting it out alone. From 1793 to 1804 there were no less than five independent rivals. By 1804 the Northwest Company had succeeded in effecting a consolidation of the independent companies into a strong fur trading company that for nearly two decades more held its own against Hudson's Bay. It was said of this new and vigorous result of consolidation that the Northwest Company was perhaps the most efficient and effective economic concern that had been organized in the New World. Without doubt the battle for the western field up to 1814 was decidedly in favor of the Canadian company, and a significant reason for that success was the wide spread use of pemmican as a provision food among its field men.

Opposition from the Hudson's Bay Company was gradually becoming more vigorous and effective, but the Northwest Company remained in the ascendancy. Hudson's Bay posts were costly to maintain because most of their food supply had to be imported from England. Hudson's Bay personnel consisted as yet largely of "gentlemen" who would not, like the Canadians, give up civilized living for the fur trade and learn to relish pemmican as a food in the back country. Meanwhile the Northwest Company was buying pemmican from several of the tribes of Plains Indians, and was itself manufacturing pemmican in enormous quantities around Pembina on the Red River, where a settlement of French and English half-breeds, the Metis of the Canadian Plains, were making a living running buffalo and making pemmican from the meat.

The Hudson's Bay Company took frequent steps to harass its rival and finally hit upon one strategy either by design or accident that brought the Northwest Company to its knees and then completely eliminated it through merger. Ten years were required for this transfer of control. In 1811 the Earl of Selkirk purchased from the Hudson's Bay Company a large tract of land including the areas occupied by the Red River Metis. It was Selkirk's hope to form a Utopian farm colony of displaced Scottish highlanders. This objective was never achieved, but the indirect results were enough to eliminate the Northwest Company. From 1812 to 1814 around three hundred colonists arrived at the Selkirk settlement. Nature in the form of drought, flood, and grasshoppers proved discouraging to agriculture, but the reaction of the Northwest Company was even more of a deterrent. The settlement extended directly athwart the Northwest Company's route from Montreal to the west, and both the Northwesters and the Indians objected to agricultural settlement in the chief buffalo hunting grounds. In short, the Northwest Company looked upon Selkirk's newcomers as invaders whose presence was detrimental to their interests, and awaited a chance to destroy the colony. Violence broke out, and crops and dwellings were destroyed. Furthermore and counter to the wishes of settlement leaders many of the young men began to adopt the semi-nomadic life of the Metis and to take part in pursuit of buffalo. Meanwhile it was charged that the Northwesters were taking too much food out of the country while the legal settlers went hungry. Early in 1814 an embargo was placed against removing provisions, meaning pemmican, from the area. The Northwest Company refused to comply, whereupon Governor MacDonnell, acting for the colony, seized 600 bags of pemmican, and the "pemmican war" began. Trouble of this type was just what the Hudson's Bay Company had been hoping for, and in 1821, under official Commonwealth pressure, hostilities ended with the merger of the two rival companies under the name of Hudson's Bay Company.

After the merger every phase of life in the Red River Valley increased in scope. Within ten years the population had grown from some 300 to 2400. By 1843 total population passed 5000, and this figure nearly doubled before the end of the decade. A few of the older members tried to farm; the main activity, however, continued to be the production of pemmican. Inter-marriage with aborigines and ten years of the free, roving life of the plains hunter, had rendered agriculture distasteful to the younger portion of the sturdy Scots, whereas the French Metis wilfully clung to old habits. Thus a large majority of the people forming the settlement followed the chase, presenting the anomaly of a sedentary community subsisting by pursuits common to a nomadic life.

Methods of the hunt were similar to those in use many years before. Regiments of buffalo runners, with a large following of retainers and impedimenta, swept over the plains twice annually, bringing wholesale slaughter and destruction to its shaggy herds, the product being sufficient to maintain the colony in plenty, and even in comparative luxury, for the remainder of the year. These hunts provided an almost certain means of livelihood, and for the amount of labor required, offered inducements far superior to those from agriculture.

Numerous details of these picturesque and adventurous hunts are available in the literature. The hunting season of 1840 provided many writers with colorful descriptive material. Parties to the summer hunt started around the first of June and remained on the plains until the beginning of August. They then returned to the settlements for a short time for the purpose of trading the pemmican they had prepared. The autumn hunters started late in the month of August and remained

on the prairie until the end of October or early November, when they returned bringing, along with pemmican, great quantities of fresh meat preserved at this late season by the cooler temperatures. The initiation of the fall hunt was always set for the first days of September, and the place of the rendezvous was usually near Pembina Mountain on the Dakota boundary.

The encampment for the fall hunt of 1840 numbered 1630 persons, and it was described as the largest hunting camp in the world. On the way to the hunting grounds no attention was paid to small bands and no shooting was permitted. When fresh meat was needed, a rawhide rope was sometimes used to entangle a cow and throw her to the ground while her throat was slit. When the main herd was sighted, about 400 huntsmen mounted and readied themselves for the starting signal. Usually it was possible to move within a mile of the herd before the charge signal was given, and the horsemen were within 400 or 500 yards before the buffalo started to take flight. Then it was a matter of fast and skillful running and shooting, amid smoke and dust for an hour or more, until many hundreds of buffalo carcasses strewed the plain. Hunters with the swiftest and the best trained horses frequently would bring down ten or twelve; those with ordinary mounts would average three or four.

A prosaic account tells only half the story of the skill, courage, and adventure associated with a buffalo run. The mounted hunters were armed with flint-lock, muzzle loading muskets. A powder horn with a large vent, from which the stopper had been removed before the hunt, hung from the shoulder. The hunter's mouth was filled with musket balls. When a shot had been delivered the hammer and pan-cover of the gun were quickly drawn back, the muzzle elevated, the powder horn inserted and its contents permitted to run freely into the barrel until the hunter judged that a sufficient quantity had run in, after which the horn was dropped and allowed to fall into holster position at the hunter's side. The muzzle of the gun was now drawn to the hunter's lips, a salivated bullet was virtually spit into it and the rider was ready for another victim. All this was accomplished with the horse racing at top speed. By keeping the muzzle of the gun elevated and only depressing it at the instant of firing the charge remained in place. In the hunt of 1840, 2500 buffalo were killed. The process of skinning and cutting meat started immediately and lasted until night fall. What remained after dark fell to the wolves. Obviously the waste was tremendous. This expedition made only 375 bags of pemmican and 240 bales of dried meat from the kill described. Seven hundred animals should have provided that amount. In the making of pemmican it should be noted, using only the lean meat, one buffalo produced one 90-pound bag of the processed food.

Production figures were never carefully kept, hence only fragmentary information can be provided about the size and extent of these expeditions. In 1820, 540 buffalo carts took part, and in 1830, 820 were listed. In 1840, 1630 people were involved and 1210 carts were used to haul the finished product home. From 1821 through 1840 a total of more than 650,000 buffalo were killed. The 1840 hunt represented the peak of activity, although in 1847 some 1200 carts were still reported. But the following year only 603 were used, and by 1850 the figure was 500. After 1844 and up to 1858 buffalo hides entered the picture commercially and many of the animals were killed for their hides alone. After 1847 no large herds were left in Canada, and commercial hunting was virtually over.

In earlier years pemmican was bartered or bargained for on an open market. By 1840 the Hudson's Bay Company had established the price at two pence a pound. From the sale, even at this price, hunters received as much or more of a

financial return than the farmers of the area received for the produce of their season's work in the fields. By the late 1840's the product was becoming so scarce that the price had gone up to one shilling three pence a pound. The fur empire of the far northwest had been based upon a cheap as well as versatile provision. This latter price was prohibitive, and as a reflection of a vital scarcity, it marked the twilight of the fur baron's domain. The passing of pemmican, it must be concluded, more than any other factor, brought an end to the older order of fur empire that had reigned so supreme in the Canadian Northwest during the first half of the nineteenth century.

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## LIMITS FOR AMERICAN DESERTS AND OASES \*

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### Diminishing Deserts

For several decades the trend among American and European geographers has been to reduce the use of the term "desert" to the truly arid regions and to employ words like "steppe" and "semi-desert" for places that are only semi-arid. Thus in the United States the "desert" has diminished from "everything west of the forested country," to the lands west of the Rocky Mountains, to an arid core in the Southwest.

In North Africa the first explorers described the Sahara as beginning a short distance south of Algiers, whereas later journals and geographies gradually reduced the Sahara to the region south of the Saharan Atlas. In southern Africa the reduction of the desert from the Kalahari and surrounding areas to the much smaller and drier Namib is a parallel case. This trend is partly a recognition of our increased knowledge which makes it possible to distinguish between partly-desert regions and more complete deserts.

We are dealing here with deserts in the total or regional sense, of course, including both physical and cultural elements. The purpose is to derive concepts and terms that will be useful in undergraduate college courses and in general professional discussion.

In earlier days it was probably both logical and appropriate to apply the term "desert" to any region that was more arid or barren than familiar humid landscapes. But now that we have the full range of dry lands in view, together with general maps of climate, vegetation, land use and so on, and it is both possible and necessary to distinguish among real desert, grassy steppe, and the intermediate lands of sagebrush or mesquite. To avoid confusion in elementary courses, the terms applied to American regions should fit into the world pattern of dry lands. We should not use the unqualified word "desert" to apply to a habitable semi-arid region of grazing and dry farming in North America, and then use the same term for the Atacama or the Empty Quarter of Arabia.

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Fig. 1. Major patterns of land use in western United States.



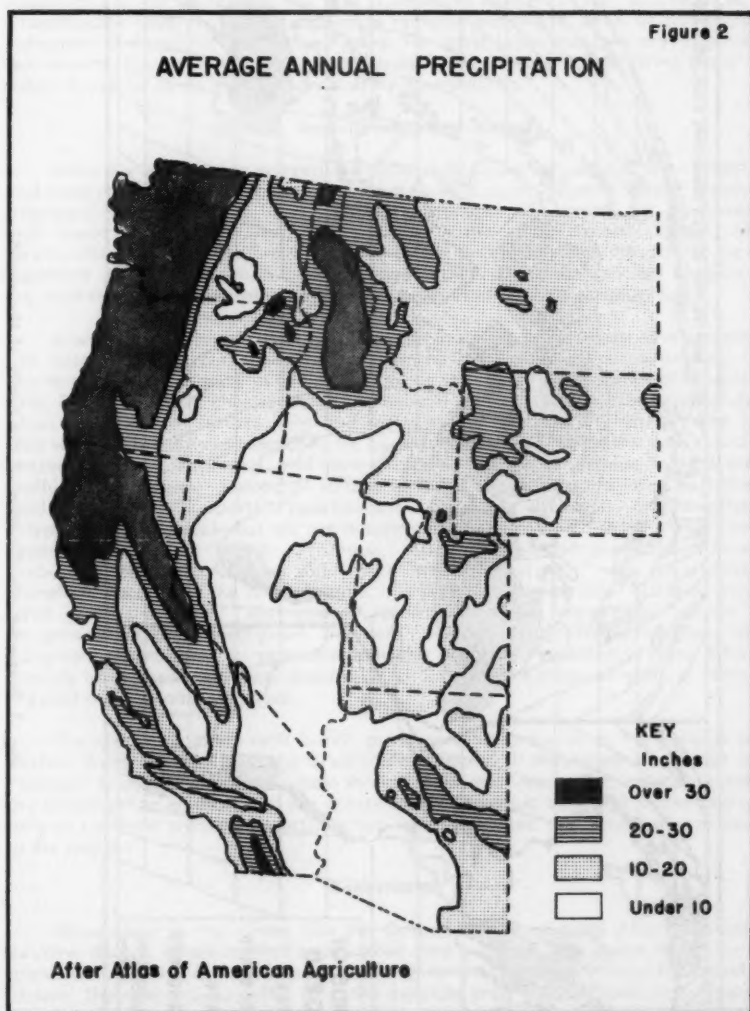


Fig. 2. Annual precipitation in western United States.

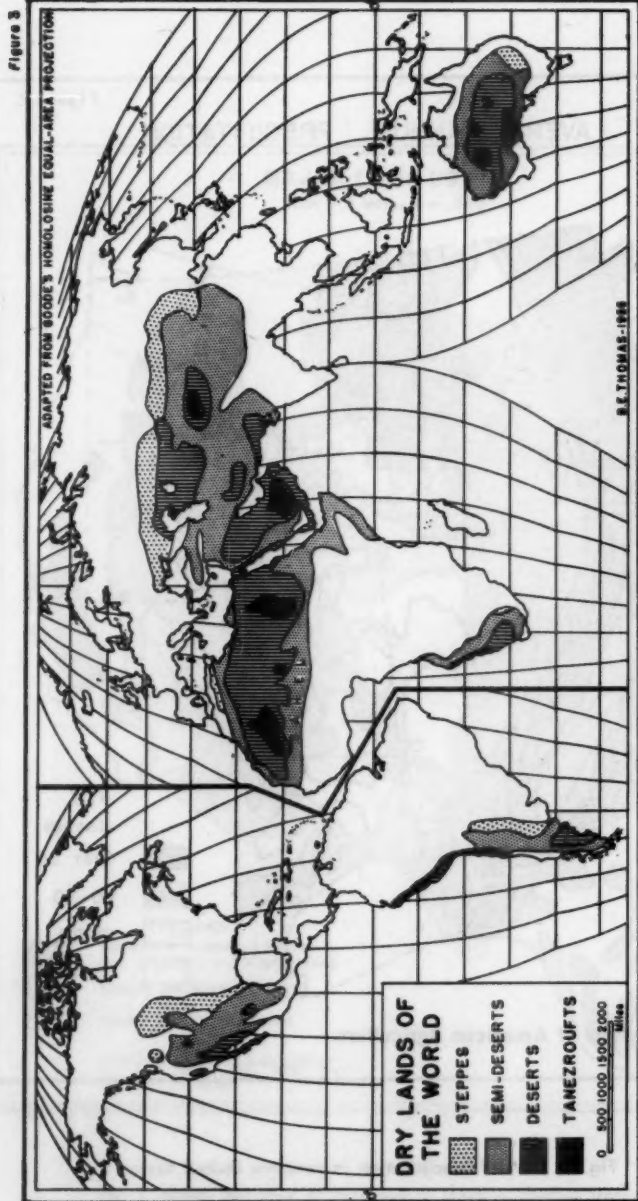


Fig. 3. Proposed classification of dry lands of the world.

The writer agrees with the American tendency to use "desert" for only the driest parts of the Southwest. The "BW" Climate of Köppen or the "E" Climate of Thornthwaite cover somewhat the same regions and might serve as adequate indicators of desert for general purposes. For other lands that are dry, but not real deserts, the writer suggests "semi-desert" and "steppe." Both terms are already in use by some geographers and by agriculturists.

#### Deserts, Semi-Deserts, and Steppes

Many land use maps suggest the three-fold division of desert, semi-desert, and steppe. Figure 1 is simplified from a map by F. J. Marschner. "Desert Mostly Ungrazed" corresponds to the writer's concept of desert. It includes only areas like the Mojave, Imperial Valley, the Black Rock Desert of western Nevada, and the Great Salt Lake Desert. In those places the annual precipitation is usually less than 5 inches, vegetation is of almost no value for grazing, and the land is generally mapped as desert in all aspects of geography.

A second category, "Desert Shrubland Grazed" or semi-desert, covers areas like western Texas, southern Idaho, northern Nevada, and southern Wyoming. It has certain desert aspects in its vegetation, its soils, and the presence of alluvial fans. But other desert characteristics are usually absent, such as extensive sandy areas (ergs), gravel surface (reg) and rocky plateaus (hamadas). The climate is only semi-arid, with a rainfall of 7, 10, or even 15 inches. Most of the land can be grazed by sheep. This map, and several others, suggests that these regions are really "poor pasture" instead of desert. In North Africa and the Near East this kind of country supports a considerable nomadic population and is called "steppe," not "desert." But we are accustomed to terms like "desert shrub" for sagebrush instead of "sagebrush steppe." Also, we American geographers have associated terms like "steppe soils" and "steppe vegetation" with grasslands. Therefore, because of the related terms, it is probably best to label our semi-arid scrub grazing lands as "semi-desert" rather than either "desert" or "steppe," for general regional description. The term "semi-desert" is sometimes used by European geographers for approximately the same kind of country. Also, it has already been applied to local areas on U. S. Government maps of types-of-farming and natural land-use areas.

The semi-arid lands with bunch grass or short grass as in the Palouse of eastern Washington and on the Great Plains seem to fit the American concept of "steppe" in everything from climate through soils and vegetation, to grazing and dry farming. The landforms of the grassy steppe, it should be noted, usually have little in common with the deserts. Buttes, mesas, wadies, reg, and ergs are rare in the steppes.

#### Tanezroufts

Some parts of the world, like the Central Sahara and the Atacama, have extreme deserts where rainfall approaches zero and not even desert shrubs will grow. Where there are no oases or mining camps, population may be entirely absent. The term "tanezrouft," from the desolate area by that name in southern Algeria, is often applied to these absolute deserts. In a world-wide system the tanezroufts form a more extreme type than the deserts of Southwestern United States. We arrive, then, at four classes of dry lands: steppe, semi-desert, desert, and tanezrouft. Such a division seems more appropriate than the old one of merely dividing the American dry lands into desert and steppe along the 10-inch rainfall line.

### The 10-Inch Rainfall Theory

The 10-inch isohyet method (see Figure 2) includes too much in desert. It also throws the scrublands of such areas as Utah, eastern Oregon, and eastern Arizona, into the same category as the Great Plains, and it does not fit our teachings on climate, soils, vegetation, agriculture, and settlement. None of these elements, as revealed by field studies and as expressed on the well-known maps that we use for teaching, show any close relationship to the theory that the limit of the desert approximates the 10-inch isohyet. Perhaps it is more logical to work by a reverse process: to start with the world maps which teachers and students must use, and derive the limits of our deserts and steppes from them.

### The World Pattern of Dry Lands

By superimposing small-scale world maps of climate, vegetation, population distribution, agricultural regions, and related criteria, one may apply the philosophy and definitions that have been outlined and mark the boundaries accordingly. The method is somewhat similar to the one employed by Peveril Meigs and others in constructing a world map showing core areas and marginal areas of deserts (map M-97, August 1952, Environmental Protection Branch, Office of the Quartermaster General). The writer is grateful to Dr. Meigs for an explanation of the technique, which was modified for the present purpose.

World maps which are widely used in American college geography were first converted to the same projection and scale. They were then superimposed and the regions which were included as desert on all maps were outlined as the incontestable "Deserts." (See Figure 3.) Regions which were desert according to some criteria but not according to others, were indicated as "Semi-deserts." The areas which were not indicated as desert on any map, but which were still within the dry lands (regions of steppe soils and vegetation and semi-arid climate) were outlined as "Steppes." Within the Deserts the areas that had no vegetation, no agriculture, and no population, were indicated as the extreme deserts or "Tanezroufts." A list of the reference maps employed and more details on the technique are included in the notes at the conclusion of the article.

The resulting map of the "Dry Lands of the World" has obvious weaknesses in the small scale, in the errors of the reference maps, and in the methods of compiling and generalizing. Also, the author has assumed, largely on the subjective bases of general field observation and teaching experience, that four categories is about right for the purpose rather than two, or ten. However, it is hoped that the map will be useful for a general view and for world comparisons. It shows the approximate location and extent of the extreme deserts like the Atacama, the Libyan Desert, the Empty Quarter of Arabia, and the barren parts of Australia. The map shows the place of the American deserts in the world pattern. North America has a great deal of steppe and semi-desert, but less real desert, whereas North Africa and Arabia have tremendous areas of desert and tanezrouft with smaller regions of semi-desert and steppe. Under this system the Sahel, or southern border of the Sahara, and the Somaliland dry lands should be described as "semi-deserts" instead of "steppes."

### Our Wandering Oases

A related matter is the distribution of desert settlements, or oases. We American geographers are neither in accord among ourselves, nor with foreign geographers, with our tendency to restrict the deserts, when we employ the term "oasis" or "oasis agriculture" to settlements in semi-arid lands, Mediterranean lands, and savanna regions. They should merely be called "irrigated areas." It is the writer's belief that the original close association of oases with deserts should be preserved. An oasis may be simply defined as "a populated island with water in an ocean of desert."

The use of a term like "Oases of the Snake River Plain" is unrealistic. Our climatic maps show the area as "semi-arid" or even "dry Mediterranean" (Köppen Csa). The inhabitants of this semi-arid region often listen with an amused smile when the theory about the oases of southern Idaho is presented. In the winter it is very hard to convince a southern Idaho farmer that he is crossing a desert from one oasis to another when his main problem is to get through the mud, slush, and snow. The theory works better in the dry summer, but 10 or 15 inches of precipitation in that latitude is far too much for a desert.

American geography has more to lose than to gain in requiring teachers in Los Angeles, Spokane, Denver, and even central Nebraska to teach their students that they live in an "oasis." If we apply "oasis" to all these irrigated districts, the term loses its value as a label for a settlement in a desert.

Some American textbooks have already located oases on our Great Plains, in eastern Brazil, in southern Europe, and in the African savannas. This is an American custom; European geographers ordinarily do not allow their oases to stray from the desert to the steppe, Mediterranean, and savanna lands.

### In Conclusion

Perhaps we can clarify our concepts and our teaching by substituting the four-fold classification of dry lands for the 10-inch rainfall method. Also, let us use "steppe" and "semi-desert" more often in describing the American dry lands, while continuing to limit the term "desert" to the places that are truly arid. And, somewhat more difficult, let us try to confine our oases to the deserts.

Notes on the World Map  
"DRY LANDS OF THE WORLD"\*

**Deserts and Semi-Deserts.** Since the author had more adequate maps for the United States and North Africa than for other parts of the world, and could check the results against field experience, test maps of these regions were compiled first. For the United States, reference maps were converted to the same projection and scale on transparent paper and superimposed. The region indicated as desert by all the following maps was then outlined:

1. BW Climate, Trewartha's modification of Köppen's climates
2. E (arid) Climate, C. W. Thornwaite.
3. Desert Shrubforms (sagebrush, creosote bush, etc.) A. W. Küchler.
4. Desert Shrub and Desert Waste, U. S. Dept. of Agriculture, 1941.
5. Sierozem and Desert, and Red Desert Soils, A. C. Orvedal.
6. Sierozems, Desert, and Red Desert Soils, U. S. Dept. of Agriculture, 1938.
7. Desert Mostly Ungrazed, Land Uses, by F. J. Marschner, 1950.
8. Non-farming, Types of Farming, by U. S. Dept. of Agriculture, 1949.
9. Deserts, Land Use Areas, by C. P. Barnes and F. J. Marschner, 1933.

The intent was to show the area that qualifies as desert in all elements from climate to land use, according to the maps which American college instructors commonly use for reference and teaching.

The extreme limits for any desert aspect on the reference maps were also outlined. This gave the border for the maximum region that could be called desert in any respect, or the outer limit for semi-deserts.

The borders for both deserts and semi-deserts fell at about the places where the author would place them on the basis of field experience alone. Also, they corresponded roughly with the limits for "core areas" and "marginal areas" of deserts on the map of Peveril Meigs which was mentioned earlier. When reduced to the scale of the world map, the difference in boundaries obtained by Meigs, by field observation, or by superimposition were so small as to be hardly visible. The Black Rock Desert does not appear on the finished map because of its small size.

Accordingly, the limits appeared to be satisfactory for the purpose in mind,

\*The projection was modified from Goode's Homolosine Equal Area Projection, No. 201 HC, copyright 1923 and 1939 by the University of Chicago. By permission of the University of Chicago Press.



but since land use maps similar to those of the Department of Agriculture were not available for other parts of the world, a modification of the method was necessary. By experimentation it was discovered that the first six maps (which are available for the world) gave the same results as the last three maps alone (which are available for the United States only) insofar as the desert border is concerned, and that the semi-desert border was approximated by the limits of Desert Shrubland Grazed, Range Livestock, and Western Grazing Lands on the last three maps. This was to be expected, since agriculture and grazing are closely related to climate, vegetation and soils, and also because the land use maps were constructed partly on the basis of data contained on the physical maps.

It therefore seemed possible to locate the desert and semi-desert boundaries for the world on the basis of the six physical maps. To test the assumption for a second region the six maps were superimposed and the borders outlined for North Africa. The results were then compared with the following recent maps:

1. "Les Limites du Sahara Francais" by R. Capot-Rey. Travaux de l'Institut de Recherches Sahariennes, Algiers, Tome VIII, 1952.

2. "Le Sahara des Nomades," Centre de Hautes Etudes d'Administration Musulmane, Paris, 1952.

As in the case of the United States, the borders for desert and semi-desert on the test map were in accord with the concept and limits for plain desert and part desert in terms of human geography. Date cultivation is restricted to the oases of the desert, nomads are numerous in the steppe and semi-desert but rare in the desert. The density of grazing animals in the semi-arid regions is often ten times that of the desert. Also, the boundaries again fell at about the place where the author would place them upon the basis of field experience. Accordingly, the borders for desert and semi-desert for the world map were completed by superimposition of the six physical maps.

**The Steppes.** The borders mentioned above gave the dry margins for the semi-arid grasslands, or steppes. There are several possible criteria for the humid margin of the steppe lands, or the boundary between the dry lands and the humid regions. In beginning college courses dry lands are often defined in terms of both climate and vegetation. The author therefore prepared two test maps. The first outlined the maximum regions of dry lands according to either Köppen or Thornthwaite climates. The second outlined the maximum area of dry land vegetation (short grass, bunch grass, mixed desert shrub and grass, desert shrub, or bare ground) according to either Kuchler or the U. S. Dept. of Agriculture map. The area common to both outlines was then marked on the world map as the outer limit for the dry lands. The intent was to include all regions which meet the qualifications of both "dry climates" and "dry land vegetation" according to the popular American systems. In the United States the result is the well-known humid steppe boundary along the 100th Meridian.

The regions included within the dry lands thus defined, but not within the borders of deserts or semi-deserts were labeled "Steppes." These regions have soils of chestnut brown or other steppe types, and the economies are farming, grazing, or nomadic herding as indicated on the following maps:

1. Great Soil Groups, by A. C. Orvedal
2. Soils of the World, U. S. Dept. of Agriculture

3. World: Predominant Economies, by E. B. Espenshade, Jr.

4. Major Agricultural Regions, by D. S. Whittlesey

**Tanezroufts.** The extreme deserts, or tanezroufts, on the map are areas within the Deserts which meet the following additional criteria:

1. "Vegetation largely or entirely absent," A. W. Kúchler
2. No vegetation, or "waterless desert," J. Bartholomew
3. "Plantless rock deserts" or plantless sand deserts," D. L. Linton
4. Major Agricultural Regions, by D. S. Whittlesey
5. "Non-agricultural," D. S. Whittlesey
6. "Little or no economic activity," E. B. Espenshade, Jr.

The tanezroufts usually fall within the "sand" or "lithosols with rock outcrops" regions of A. C. Orvedal.

**Author Commentary.** The author, on the basis of field experience, would modify the limits for tanezroufts in North Africa. The limits for tanezroufts in Central Asia and Australia are also questionable. However, the borders have been left at the places indicated by our reference maps, as in the case of the other types of dry lands. This is in accord with the primary purpose of bringing teaching concepts and terms closer to the level of completed research on climates, vegetation, and other criteria, rather than improving or extending the research on those elements. The reader and the author also may well be aware that the arid or semi-arid regions of such areas as Southwestern Madagascar and eastern Brazil are often omitted or improperly labeled on certain of our reference maps; these additional problems are beyond the scope and purpose of the present map.

## GOLD MINING IN THE NICARAGUA RAIN FOREST\*

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In no country of the New World does gold and gold mining play so prominent a role in the national economy as it does in the Central American Republic of Nicaragua. If the USSR's production is excluded, Nicaragua's annual bullion output of 260,000 ounces in recent years has accounted for better than one per cent of the world's gold production. Among the Latin American republics only Mexico and Colombia surpass it; on a per capita basis Nicaragua (1950 population, 1,057,000) stands easily at the head of the list. With the world's gold-mining industry in the doldrums gold was nevertheless the leading export from Nicaragua every year but one between 1938 and 1949. Recently, in the face of soaring coffee prices, it has dropped to second place on the country's export list. In 1953 reported bullion shipments were valued at \$8.7 million (U. S.) or nearly \$8 per capita.

Colonial Nicaragua had no mines of importance. In the latter part of the 19th century several vein mines were brought into production in the drier and more populous western half of the country. The manager of one of these was the Englishman Thomas Belt, author of *A Naturalist in Nicaragua*, one of the real classics of natural history and geography. At least three of these vein mines still operate today, an easy few hours drive from Managua. Two of them (El Limon, La India) are owned by a Canadian company (Noranda Mines, Ltd.), while Belt's old Javalí mine in Chontales is in the hands of local Nicaraguan capital. Together they account for about one-third of Nicaragua's gold production.

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\*The writer visited Nicaragua in the spring of 1953 in connection with field studies supported by the Office of Naval Research. He also acknowledges the hospitality and assistance of his friend Stuart McCullough, manager of the Neptune Gold Mining Company of Bonanza.

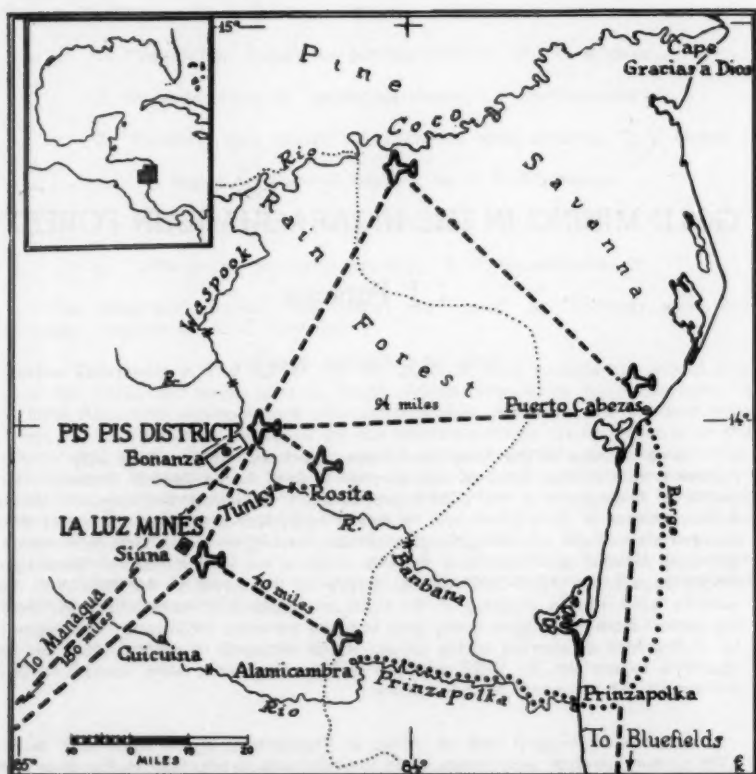


Fig. 1. Mining districts and main transportation routes of northeastern Nicaragua.

The larger share of Nicaragua's gold comes from mines located in the rain-drenched hills 180 miles east of Managua and 90 miles from the Atlantic coast at the headwaters of tributaries of the Río Coco and the Río Prinzapolca (Figure 1). These mines were discovered in 1889-90 by castilla rubber collectors moving up the navigable rivers from the Miskito Coast. In Latin America the good mines are almost always *antiguas*, but there is no indication that the existence of gold here had been known either to the Indians or to the early Spaniards. The reason is not difficult to see. The rain forest of eastern Nicaragua is one of the least accessible and least known areas of tropical America. Its only roads are the rivers, which are fed by an annual rainfall which ranges from 100 to 150 inches. Along the Caribbean coast and extending northward into Honduras there is an extensive quartz gravel plain which is covered with pine savanna, perhaps the rainiest area of such size anywhere on earth which is a grassland. The boundary between savanna and forest (the "bush lines") lies roughly half way between the coast and the mines.

#### The Pis Pis District and La Luz

There are no placers of consequence in eastern Nicaragua. The gold most commonly occurs in veins that were intruded into the Tertiary andesite lavas which cover much of the central interior of the country. The Pis Pis District is characterized by a complex pattern of roughly parallel auriferous quartz ledges and stringers which stand up a ridges against the softer, deeply weathered country rock. The geologic pattern has been likened to that of California's Mother Lode region. At La Luz the ore is disseminated through an extensive limestone mass, a part of a larger limestone island which was left uncovered by the lavas.

Two major companies today account for the entire production of this eastern Nicaragua gold area. Each produces about 70,000 ounces of bullion annually, each employs about 1,200 men, and each operates a modern mine and mill which is entirely dependent on air transport for its supply. The Neptune Gold Mining Company of Bonanza is a subsidiary of the American Smelting and Refining Company. It represents the consolidation of what were formerly many small claims and workings in the Pis Pis District. The company's concession, two miles wide by twelve miles long, includes some dozen operating mines which are connected with the mill and town at Bonanza by roads and an aerial tramway. La Luz Mines, Ltd. (earlier La Luz y Los Angeles Mining Company), 20 miles to the south at Siuna, is controlled by the Canadian holding company Ventures, Ltd. (other Ventures properties include Falconbridge Nickle Mines and Giant Yellowknife Gold Mines, both in Canada). La Luz is really a single mine which has operated more or less continuously since 1897 except for a 10-year interruption resulting from bandit raids and the consequent civil upheavals after 1928. Long an open-pit operation, it has recently shifted to underground workings. Mining is being carried on to depths of 1200 feet, as compared with the maximum depth of 700 feet which has been reached at Bonanza (Neptune shaft). La Luz ores average four dollars a ton gold content, the Bonanza ores ten dollars a ton. Silver, a minor by-product of both operations, is more important at Bonanza than at La Luz. The Bonanza ores are milled and treated by the cyanide process; at La Luz flotation is employed.

Both Bonanza and Siuna are company camps and their only reason for being is gold. Each has a population of about 5,000 persons, including "Spaniards" (Nicaraguans), Miskito and Sumu Indians, and English-speaking "cre-

oles" from Bluefields, the Miskito Shore and the Cayman Islands. The technical staff of Canadians and Americans numbers about 20 at Bonanza, somewhat more at Siuna. The English, Spanish, and Miskito languages are of roughly equal currency.

#### Dependence on Air Transport

For 18 years, or since the present operating companies entered the picture and instituted the major development programs which have brought production to current levels, the dependence on air transport has been complete. Both companies have freight-hauling contracts with the Pan-American subsidiary, La NICA, which operates a fleet of DC-3 cargo planes between the mines and the coast. Cement and sand for dams, turbines, steam shovels, trucks, ore crushers, bulldozers, hoists, mill equipment (including sodium cyanide and balls for the ball mills), and most of the food and drink consumed by a population of 10,000 persons are all moved by air. There is no other way short of human carriers or dugout canoes.

In recent years each company has been moving 2,500-3,500 tons of cargo annually to the mines by air. This has required in all a total of close to 2,500 round-trip flights a year. The figure was higher when the major mill installations were being made. Puerto Cabezas, originally built by the Standard Fruit Company as a banana port but now a lumber town, is the port through which imported machinery and supplies move. There is regular steamship service from New Orleans and Tampa. Cargo destined for Bonanza is flown directly in from "the Port." The contract fee in 1953 was \$50 a ton for these cargo movements, the flight capacity being about two and one-half tons. Material destined for Siuna, on the other hand, is usually moved by tug-propelled barge down the coast and up the wide and sluggish Rio Prinzapolca 150 miles to Alamicambra on the inner savanna margin. From the airstrip here cargo planes shuttle to and from Siuna, a distance of 40 miles. A road now under construction through the rain forest will eventually link Alamicambra with Siuna and so eliminate the costly air haul for the Canadian company, but between Siuna and Bonanza there will still be nothing but a forest track.

Bonanza obtains the limestone used in the cyanide process from an outcrop at Monte Carmelo, near Rosita, by means of a weekly flight to the small airstrip there. Rice, red beans (Bonanza alone takes more than 200 tons a year), and cut beef are flown in from the Río Coco; soft drinks, soap, sugar, eggs, white cheese, coffee, and aguardiente come from Managua, whereas imported canned goods, including beer, are transshipped through Puerto Cabezas. In addition to these cargo runs there is a daily passenger service between Managua, Puerto Cabezas, Bluefields, and the mines. Beef cattle may be driven in over forest trails either from the Río Coco savannas or from the Matagalpa area of the interior. Locally grown maize, plantains, yuca, pork, and chickens contribute a portion of the food needs at Siuna, where limestone soils also permit production of some cabbage, rice, and beans, but the red lateritic earth around Bonanza has been found unable to support such garden agriculture.

The energy, pluck, and perseverance of the U. S. and Canadian miners who opened up this isolated area some 65 years ago has few parallels in the annals of pioneer mining. In 1920 a trip from New Orleans to the Pis Pis District or to La Luz required from ten days to two weeks even when all conditions were favorable; more often it would take a month. (1) Freight delivery was not expected in less than two months. Bluefields was long the administrative cen-



ter for the mines and goods from the States had to be transhipped by coasting vessels from Bluefields Bluff to the Prinzapolca Bar or Cape Gracias a Dios. Bluefields was a "New Orleans town," with weekly steamer service to the Louisiana city. For many years the Louisiana State Board of Health kept a resident inspector there to clear vessels heading north. With a Gold Rush superimposed upon an already thriving trade in bananas and rubber Bluefields for a time seemed on the verge of commercial greatness. "We need only a Rhodes," wrote a local newspaper editor at the turn of the century, "to make us another Johannesburg." (2)

#### Early River Routes to the Mines

Of the routes of entry to the mines that through Cape Gracias was earliest developed. (3) There was weekly steamer service 200 miles up the meandering Río Coco to the Río Waspook. From the Waspook mouth it was 4-5 days in a dug-out canoe (*pit-pan*) to the bodegas of the upper Río Pis Pis, from whence mules or pack oxen provided connections with the several mines. The second or Prinzapolca route became more popular in later years whether one was going to the Pis Pis District or to La Luz. In the former case the Río Banbana, a tributary, could be navigated with difficulty to beyond Tunky by pit-pans poled by 15-18 men. For the last 50 miles it was more a creek than a river, with several rapids that in low water could be passed only with the aid of stationary winches on the banks. A visitor in 1920 wrote of the Banbana: "In no other country in the world would such a stream be used for navigation and its use here would be impossible but for the exceptional skill and hardness of the Indian boatmen." (4). From Tunky it was nearly 20 miles by mule, pack ox, or women carriers to the mines. The other route to La Luz was up the Prinzapolca to above the old placer camp of Cuicuina, from whence mud sleds pulled by oxen were used for the last five miles. By either route the trip from New Orleans was not an unpleasant one, it was said, if one were fond of water.

By 1892 there were reported to be some 500 men working placers in the Pis Pis District and another 300 on the upper Prinzapolca (Cuicuina), but already attention was turning to hard-rock mining. (5) La Constancia, the first quartz vein discovered in the Pis Pis area was already in production in that year. Others followed in short order, always small operations undertaken by Canadians or Americans working in the soft, enriched oxides of the weathered surface exposures of quartz. By 1917 the oxides had been worked out in most of the mines and attention was turning to the more complex sulfides below them. Consolidation of the many small holdings occurred at this time and considerable investment was made in new stamp mills and ball mills for the harder sulfide ores and the installation of dams, hydroelectric plants, and cyanide mills. (6) The Eden Mine, a consolidation of three mines owned by the Tonopah Mining Company, alone received \$2½ million worth of improvements between 1917-1921, including a tramway which was built from the head of navigation at Miranda, a few miles above Tunky, to the mines. But as with most of the others it ended in bankruptcy.

At Siuna the Las Luz y Los Angeles Mining Company, owned by Pittsburgh interests, operated more or less continuously and profitably from 1897 to 1928. Like the Pis Pis District mines it, too, shifted to sulfide ores during World War I, but here the ores were more widely disseminated and leaner. (7)

By 1921 there were some 2,500 people living in the eastern Nicaragua mining area. *The Mining and Scientific Press* estimated that although \$12-14 million in bullion had been taken out of the Pis Pis mines and \$4-5 million from La Luz y Los Angeles, the total expenditures in the area to that time had probably equalled if they did not exceed the amount of gold produced. (8)

The present development period, which dates from 1937, has a much more solid foundation. At Bonanza there is some four years supply of ore blocked out; Siuna reports eight. In addition La Luz owns a substantial deposit of three per cent copper ore at Rosita on the Río Banbana which, if brought into production, may one day become the tail that wags the dog. Diamond drilling has delineated a three and one-half million ton ore body which, at current copper prices, should yield a gross of more than \$80 million. The ore would be electrolytically refined so that a major hydroelectric power development above Tunky is contemplated. A branch road from Alamicambra to Rosita is now under construction. At Bonanza there are possibilities of lead and zinc ores at depth which may eventually be developed. If they are it would probably necessitate construction of a motor road to the coast at Puerto Cabezas to handle ore shipments.

#### Bonanza and Siuna as Places to Live

Bonanza and Siuna are typical mining camps, makeshift collections of unpainted board-and-batten structures scattered about without apparent plan. To look at them, as a visitor recently wrote, (9) you would think them wretched places in which to live. Yet a warm and friendly spirit pervades them. One senses it whether on the street or in the commissary, the *cantina*, the church (Roman Catholic and Moravian Brethren), the school, the mine, or the mill. This is especially true at Bonanza where many of the important supervisory posts are held by Latins and where the staff lives scattered informally throughout the hillside section of the town in unpretentious but nicely furnished houses. At Siuna the foreign staff lives some distance from the town in neatly painted white bungalows surrounded by wide lawns, flower gardens, and fences.

One of the principal attractions to work at the mines is the low commissary price list on basic foods. At Bonanza, for example, both wages and commissary prices have apparently been held to the 1939 level so that the company, while paying wages of but \$1.00-\$1.50 a day, sells meat at 15 cents a pound for which it pays 40 cents, sugar for three cents a pound, a six dollar pair of shoes for one dollar.

Cheap labor and a favorable political climate makes gold mining in Nicaragua profitable today even where transport costs are high and the ores are of relatively modest richness. The Nicaraguan government's direct tax take is not large, being derived chiefly from the \$17 a kilogram export tax on gold. In addition there are other "special contributions" which must be paid as well as a nominal income tax. In 1954 the Neptune Gold Mining Company, for example, paid an announced \$214,000 in taxes and fees in Nicaragua; the La Luz annual report indicates payment of a \$96,000 Nicaraguan "bullion tax," but this lower figure does not include customs duties or land taxes. In addition the companies pay the cost of the schools, the police force, the hospitals, and public health service.

Labor turnover is high, especially at Bonanza where Indians comprise the larger portion of the labor force. Tuberculosis, rather than malaria, is the principal health problem and the mining companies are exerting great care in screening out all tuberculous who may apply for work.

When the mines are closed down, as they one day will be, Bonanza and Siuna will be invaded and overgrown by a tangle of lush tropical forest almost overnight. Then will come a major social and economic readjustment, especially for the Indian and "creole" communities of the coast for whom the mines provide the principal economic support. It will, however, be but one more chapter in the economic history of the Miskito Coast which in turn has been supported by export economies based on green turtles, sarsaparilla, mahogany, rubber, bananas, pine lumber and, now, gold. (10)

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## ATHENS: MODERN GREEK DILEMMA

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To people the world over, the very word Athens is a symbol of that ancient classical period when Greece was the uncontested cultural center of the western world. And, indeed it might, because the city is still crowned today as in the past by the Acropolis, where the stately Parthenon, ruined though it is, conveys the beauty and genius of that glorious era of Greek history. The phenomenal growth of the city over the centuries has become a pride and joy of the Greeks, yet, at the same time, the increase in population in Athens has become one of the major problems of the modern Greek state.

Athens, the largest capital in the Balkans, is today the greatest area of population concentration in Greece. The conurbation, which includes the port of Pireaus, contains some 1,400,000 persons, nearly 20 per cent of the entire population. (Table 1) And the postwar increase has been so great that there is a shortage of most of the services needed in a large city, water supply, electricity, fuel, houses, plus lack of employment for many of those who have continued to flock to the city in increasing numbers.

For the geographer, an immediate question is posed: Why has Athens grown to such proportions and how can it maintain such an enormous population? The answers must be sought not only through an analysis of present conditions but also in the long centuries of historical development.

Athens is well situated on one of the largest plains of Greece. The Attic plain is open southward to the sea, but is rimmed landward by an enclosing barrier of mountains, broken by only a few, easily-defended passes. The plain is crowned by several rocky hills, such as the Acropolis, whose steep sides and flat top made it a natural site for the early development of a city in the days when natural defensibility was a paramount need. This urban nucleus lies some five kilometers from the sea, a sufficient distance to have given protection from piratic forays and naval invaders. (Figure 1).

The regional situation was similarly advantageous, because the Attic plain was a focus of land routes from the Peloponnesus and the mainland to the north. In like fashion, Phaleron Bay with the naturally protected harbor of Pireaus is a natural node of sea routes connecting the mainland with the ports of the Peloponnesus and the Aegean Isles and Crete. The construction of the Corinth Canal completed another link in its role as a *carrefours*, or maritime crossroads, although even before this it had been customary to drag ships over the narrow isthmus into the Gulf of Corinth. The roads and railroads built in the latter part of the nineteenth and early twentieth centuries still centered, of necessity, on Athens. And, when air routes were developed over the Mediterranean, Athens continued to be a natural converging point of routes from Italy, the Balkans, Crete,

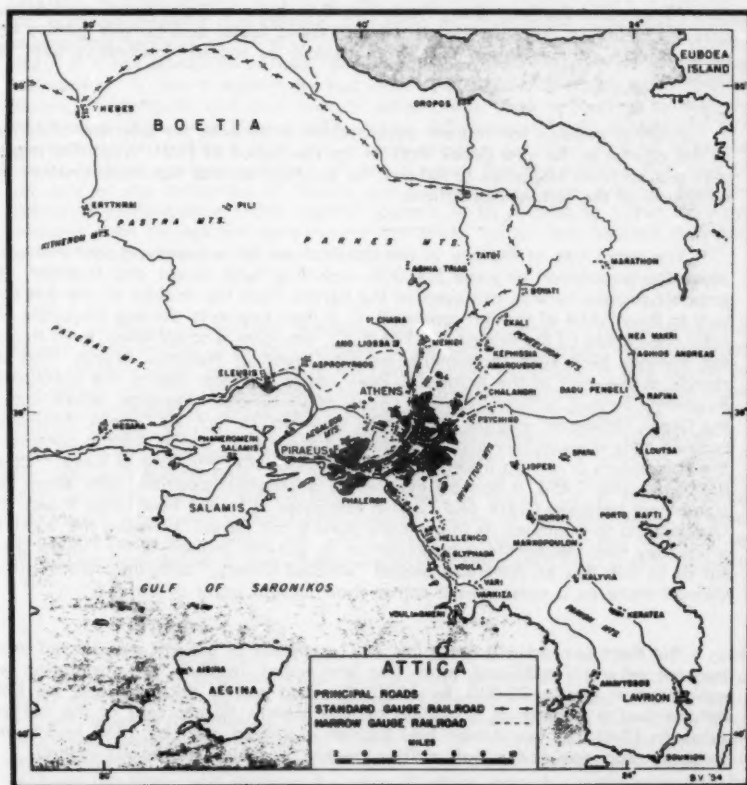


Fig. 1. Attica and the situation of Athens.

Asia Minor, and the Near East. Trade has thus been a major function of Athens over the centuries, creating the wealth that could foster architectural genius and philosophical contemplation that would stand as human landmarks over the centuries.

Another impetus for modern development came with the selection of Athens as the capital of the new Greek state in the revolution of 1821, when the capital was moved from Nauplion to Athens, for political control has been another determinant of the fortunes of Athens.

The exact size of the city in the classical period is unknown, but estimates place the population at some 500,000, including both slaves and freemen. The greatest prosperity was achieved in the period from the middle of the 5th century to the middle of the 4th century B. C. It then began to decline markedly and after the victory of the Romans in 146 B. C., was only a small town, even though the Romans built such monuments as the Odeon of Herodus Atticus, that still stands at the foot of the Acropolis. Even under the later rise of the spectacular Byzantine Empire, which adopted Greek as its official language, which spread the Greek Orthodox religion, and which was run, in fact, by Greeks, Athens remained only a secondary provincial town, hardly even a dim light in contrast to the splendours and magnificence of Constantinople, the "city of kings." Under the Turks after 1458, it had an even more anomalous position, with sharp disagreement between Greek and Turkish estimates as to just how large it was. The Greeks tend to minimize its importance during this period, blaming the Turks for what they term deliberate suppression of its growth. Indeed, some Greeks go so far as to dub this an Athenian period "without history," although this might be viewed more as a nationalistic rather than factual point of view.

But there is no doubt that after 1821 a period of growth was started which has not yet even stabilized, much less terminated. In 1848, the population was estimated at nearly 32,000. By 1870, this had nearly doubled, and by 1907, Athens had a quarter of a million people, nearly 10 per cent of the national total. In 1940, the population had topped a million, and by 1953 had soared to more than one and a half million people, a major metropolis indeed.

As in the case of so many other large cities of the world, statistics of Athens are not easy to understand or to reconcile. There is a municipality of Athens, with a population of 565,084. The administrative conurbation, or as it is called, Athen and its environs, has a total of 1,378,586. But to actually estimate the total population of Athens, including the fantastic growth of new suburbs in nearby unincorporated areas of the Nomos of Attica, one should count nearly the total population of the Nomos, which numbers 1,553,815.

Basically, then, Athens is well situated from the points of view of geographical location, commerce, and political administration. The difficulties arise from the continued increase of urbanization in the face of limited arable area in the Attic plain, indeed a limitation faced in all parts of Greece, and the local agricultural supply area is constantly being decreased by enlargement of the city, a situation not unlike that being faced presently in Los Angeles. Furthermore, there is a lack of coal, iron ore, and petroleum for modern, large-scale industrial development. But these basic difficulties have been offset somewhat



by other factors. The large population forms a ready and easily accessible market, and is at the same time a large and cheap labor supply. There is also capital, both government and private, available for investment, plus ready access to shipping facilities in the port of Pireaus. And in this modern age of bureaucracy, it is not unwise to be near government agencies empowered with economic control. A recent advantage has been the cheaper cost, by governmental decree, of electricity and coal than in other areas. And in contrast to the city, the interior regions of Greece offer major difficulties to industrialization owing to isolation resulting from poor communication facilities, lack of industrial power, lack of markets, and lack of skilled labor. The net result is that over 80 per cent of the industries of Greece are located in or near Athens. And this industrial concentration in the capital appears to be increasing rather than decreasing even though the government has taken rather half-hearted measures to limit the construction of new industries.

All of these reasons are certainly valid, but no analysis of the growth of Athens could in any way be complete or indeed at all correct without an attempt at description of the lure to the Greek of life in Athens, a lure baited by variegated color, by distant vistas, by the multifarious nuances of living in a city of classical antiquity whose relics serve as landmarks of man's rise in the western world, and by the many everyday experiences which point up the fact that in this metropolis the western world mingles with the oriental facets of the Near and Middle East. This lure is so strong that many people, both Greek and non-Greek, end by saying simply, "I will be there." Or, to put it another way, those who have tasted honey will not easily or willingly return to vinegar; those who have tasted the white bread of Athens will not willingly return to the dark bread of the villages, especially since each kind carries its social mark.

To the Athenian, each section of the city is a matter of individual pride and beauty. On a sparkling clear day the city shines in the sun, the gently-rising plain rimmed by the steep slopes of Parnes, Pentelikon, and Hymettus and set between the celestial blue of the sky and the matching blue of the Mediterranean waters. The Acropolis stands out in sharp and simple symmetry against the sky. Its sister, Mount Lycabettus, rises starkly nearby, the two of them splitting the plain and shaping the axes of urban growth. To the west lies the major axis along the Kiffos River. North of Pireaus the industrial district is marked by a pall of smoke that is the beginning of a smog problem for Athens. Then come residential districts that spread northeastward toward Mount Parnes and the summer homes and summer palace at Tatoi. Between the Acropolis and Lycabettus has come the commercial development, centered on Independence Square, which faces the Parliament Building. The most recent urban development is to the east along a new axis of growth between Lycabettus and Mount Hymettus where modernistic residential suburbs stretch as far as the older summer residential villas at Kiffissia. The city is also extending southeastward between Hymettus and the bay where the new Athens airport is set amid sea-side villas and tourist hotels.

Then, too, the Athenian enjoys the variegated patterns of life in the city. The old commercial section retains the narrow streets, small shops, and myriad colors and smells of the Levantine world where the donkey replaces the less

adaptable, and wider, automobile. The coffee shops of Omonia and Independence Squares supply the spice of political exhortation and vociferous companionship which the Greek deems a necessity of life, and nearby Kolonakis Square has produced numerous political leaders who constantly furnish a new governmental crisis for coffee shop analysis. This is why the villager leaves the less eventful life of the countryside for the haphazard and even perilous climb up the urban economic ladder. He starts out as a bootblack or sidewalk vendor, and usually through a friend or relative gains a higher foothold in a shop or governmental office. Finally he hopes for a measure of success as coffee shop owner or governmental official, which, who knows, may even be a step to becoming an economic tycoon or a Cabinet Minister.

If it is merely life in a city that is so attractive, one might logically ask whether the other towns of Greece show similar signs of growth and development. But, although the towns of Salonika, Patras, Volos, and Larissa do show signs of increased population due to local migration from the villages, these towns seem to be in reality intermediate steps to a final move to Athens. Hence there can be no doubt that the paramount attraction is Athens itself. It is precisely this feature which makes the problems of overpopulation difficult to solve and raises the basic issue that the only way to find a solution is to seek means to make the countryside not only more productive economically, but also to make the everyday life of the villager more compatible to that of the big city. For Greece, with all of its geographical limitations, this will be a formidable and difficult task indeed.

TABLE I  
POPULATION OF ATHENS, GREECE

Census Year	Total Pop. of Greece	Population of the city of Athens	Population of Athens and its Environs	Percentage of Pop. of Athens to Total Pop.	Percentage of Pop. of Athens and Environs to Total of Greece
1848	986,731		31,535		3.20
1853	1,035,527	30,590	36,594	2.95	3.53
1856	1,062,627	30,969	39,493	2.91	3.72
1861	1,096,810	41,298	49,823	3.77	4.54
1870	1,457,894	44,510	59,154	3.05	4.06
1879	1,679,470	66,499	90,295	3.90	5.38
1889	2,187,208	110,262	148,942	5.04	6.81
1896	2,433,806	123,001	179,755	5.05	7.39
1907	2,631,952	167,479	250,010	6.36	9.50
1920	5,531,474	292,991	453,042	5.30	8.19
1928	6,204,684	452,919	801,622	7.30	12.92
1940*	7,344,860	481,225	1,124,109	6.55	15.30
1951**	7,631,124	565,084	1,378,586	7.45	18.65

Source: Royaume de Grèce. Ministère de L'Economie Nationale, Statistique Generale de la Grèce. Population de la Grèce d'après le Recensement du 15-16 Mai, 1928, Athènes, Imprimerie Nationale, 1933. Table 24, p. 23 of Introduction.

\*Greece. Bureau of Statistics. Interview with Director of Bureau of Statistics, Athens, Greece, March, 1953.

\*\*Greece. Bureau of Statistics. Interview with Director of Bureau of Statistics, Athens, Greece, March, 1953. It is officially believed that the census was actually some 6 per cent short of the actual population in Greece.

## EIGHTEENTH ANNUAL MEETING

Pasadena, California, June 20-22, 1955

The eighteenth annual meeting of the Association was held at the California Institute of Technology, in conjunction with the annual meeting of the Pacific Division, American Association for the Advancement of Science. Four half day sessions were devoted to the presentation of research papers, with a business meeting included on the morning of June 21. An all-day field trip, on Wednesday, June 22, covered agricultural and industrial portions of the San Gabriel Valley, led by Robert W. Durrenberger, Los Angeles State College. The address of the retiring president, Dr. C. Langdon White, was presented on Tuesday evening, June 21, at the annual dinner in the Green Hotel.

### Program of Papers Presented

(Papers marked with an asterisk are published in this issue)

- HARRY P. BAILEY, Univ. of California, Los Angeles. A Classification of Coastal Terrain.
- WILLIAM G. BYRON, Los Angeles State College. Some Physical and Psychological Factors Concerning Coalescence on a Dot Map.
- G. PHILIP CURTI, Univ. of California, Los Angeles. The Borrego Valley, California: Birth of a Desert Community.
- OTIS W. FREEMAN, Seattle, Washington. Rehabilitation Program of Washington Lakes.
- \*J. GRANVILLE JENSEN, Oregon State College. Tree Farming in the Douglas Fir Region; An Evaluation.
- \*HUEY LOUIS KOSTANICK, Univ. of California, Los Angeles. Athens: Modern Greek Dilemma.
- PAUL E. LYDOLPH, Los Angeles State College. Cold Water Coasts as Climatic Controls.
- \*WILLIS B. MERRIAM, Washington State College. The Role of Pemmican in the Canadian Northwest Fur Trade.
- \*ELBERT E. MILLER, University of Utah. Ram Pasture and Wall Paper. A Story of the Uranium Boom in the Colorado Plateau.
- \*JAMES J. PARSONS, University of California, Berkeley. Gold Mining in the Nicaragua Rain Forest.
- R. B. PETERS, Laguna Beach, California. Further Observations on the Geomorphology of the Lake Chapala Area, Mexico.
- EDWARD T. PRICE, Los Angeles State College. Root Digging in the Southern Appalachians.
- GEORGE A. RHEUMER, Univ. of Southern California. Polar Outbreaks in Western Canada.
- J. E. SPENCER, Univ. of California, Los Angeles. The Chronology of Domestic Architecture in Southern California.
- NORMAN R. STEWART, Univ. of California, Los Angeles. Alamos, Sonora, A Colonial Mining Community in Northwest Mexico.
- \*BENJAMIN E. THOMAS, Univ. of California, Los Angeles. Limits for American Deserts and Oases.
- \*C. LANGDON WHITE, Stanford University. Industrialization: A Panacea for Underdeveloped Countries?
- ROBERT N. YOUNG, Stanford University. A Geographic Classification of Landforms.

### ABRIDGED REPORT OF THE SECRETARY-TREASURER

The membership of the Association, on June 6, 1955, consisted of 189 regular and 8 student members, of whom 28 regular and 3 student members were in delinquent standing, indicating a slight loss in total membership, but an increase in paid-up memberships.

Matters brought up at the business meeting concerned the Yearbook, membership, and fees. Discussion resulted in the passage of the following motions.

1. Amendment to Article III, Section 1, of the Association Constitution, raising the Annual Dues for Regular Members to \$5.00.

2. Amendment to Article III of the Association Constitution, adding a new Section 4, creating a Contributing Membership carrying all the normal privileges, attained by the payment of a minimum of \$2.00 more than the Regular Membership fee, aimed at securing larger financial contribution to the Association Treasury.

3. Motion instructing the Editor of the Yearbook to publish the Annual Program of the Association as a list of titles only, excepting such papers as are selected for publication in full.

4. Motion authorizing the Editor of the Yearbook to accept for publication in the Yearbook articles not presented on the program at the annual meeting.

Subsequent action of the Executive Committee appointed J. E. Spencer as Editor of the Yearbook for another term of three years.

#### INCOME DEPOSITS

Bank Balance, 6-24-54 .....	\$440.59
Dues and Miscellaneous Contributions .....	558.41
Library Subscriptions and Yearbook Sales .....	179.08
Total Deposits .....	\$1,178.08

#### WITHDRAWAL OF FUNDS

Printing Yearbook, Vol. 16 .....	\$728.00
Yearbook Mailing Charges .....	17.74
Advance to Printer for Author Reprints .....	85.00
Total Withdrawals .....	830.74
Transfer to Sinking Fund .....	125.00
Bank Balance, 6-6-55 .....	222.34
	\$1,178.08

The Sinking Fund, authorized in 1954 (see page 67, vol. 16 of YEARBOOK), has been established by the Treasurer as a separate bank account.

#### Officers, 1955-1956

**President:** H. Bowman Hawkes, University of Utah.

**Vice-President:** J. Ross Mackay, University of British Columbia.

**Secretary-Treasurer:** Howard J. Critchfield, Western Washington College, Bellingham, Washington.

**Editor:** J. E. Spencer, University of California, Los Angeles.







